FineLine 260PC High Density Plasma Cutting System With Automatic Gas Console

Revision H
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Manual Part Number 718079

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Limited Warranty

KALIBURN expressly warrants that this product shall be free from defects in materials and workmanship, under proper and normal use for the intended function of such equipment, for a period of one (1) year for the FineLine 260PC torch and leads and three (3) years for the FineLine 260PC power supply and automatic gas console. This product is intended for commercial use and is not intended for personal, family, or household purposes. There are no warranties that extend beyond the description on the face hereof. **All other warranties, either expressed or implied, including any implied warranty of merchantability or fitness for any particular purpose, are expressly excluded.**

If this product or any component thereof is determined to be defective in manufacture, KALIBURN will repair or replace the defective component or product. The buyer's remedies are limited to the return of the product for repair or replacement of any non-conforming product or part at the sole discretion of KALIBURN. No freight charges of any kind are covered under this warranty. All returned goods shall be at the buyer's risk and expense. Beyond this remedy, KALIBURN will not be responsible for any special, incidental or consequential damages or injury to the person or property of anyone by reason of any defect in any equipment sold hereunder.

This warranty will be considered void if torches or torch consumables manufactured by anyone other than KALIBURN are incorporated into this product.

Returned Goods Procedure

KALIBURN utilizes a returned goods procedure that must be followed before returning any items for repair, replacement, or restocking. This means that a returned goods authorization number must be obtained prior to shipment to KALIBURN. It will be necessary for the customer to provide a description, along with the stock number and serial number, if applicable, of the item to be returned. In no case will KALIBURN accept a returned shipment without the proper returned goods authorization number.

Electromagnetic Compatibility (EMC)

The 380V 50Hz and 415V 50Hz FineLine 260PC plasma cutting systems are manufactured to comply with the European standards EN 60974 (Arc welding equipment – Part 1: Welding power sources) and EN 50199 (Electromagnetic compatibility (EMC) – Product standard for arc welding equipment). Information about the EMC standard EN 50199 can be found in Appendix B.

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Section 1 Safety

General Precautions

Whereas plasma cutting has been used safely for years, it does require certain precautions to ensure the safety of the operator and other people around the equipment. It is management's responsibility to see that the following safety information is provided to each person who will operate, observe, perform maintenance, or work in close proximity to this piece of equipment.

Installation, as well as repairs, made to the FineLine 260PC system should only be performed by qualified personnel. The FineLine system makes use of both A.C. and D.C. circuitry for operation. **Fatal shock hazard does exist. Exercise extreme caution while working on the system**.

Ultraviolet Radiation Protection

Plasma cutting produces ultraviolet radiation similar to a welding arc. This ultraviolet radiation can cause skin and eye burns. For this reason, it is essential that proper protection be worn. The eyes are best protected by using safety glasses or a welding helmet with an AWS No. 12 shade or ISO 4850 No. 13 shade, which provides protection up to 400 amperes. All exposed skin areas should be covered with flame-retardant clothing. The cutting area should also be prepared in such a way that ultraviolet light does not reflect. Walls and other surfaces should be painted with dark colors to reduce reflected light. Protective screens or curtains should be installed to protect additional workers in the area from ultraviolet radiation.

Noise Protection

The FineLine 260PC system generates high noise levels while cutting. Depending on the size of the cutting area, distance from the cutting torch, and arc current cutting level, acceptable noise levels may be exceeded. Proper ear protection should be used as defined by local or national codes. See Section 2 for noise emission levels.

Toxic Fume Prevention

Care should be taken to ensure adequate ventilation in the cutting area. Some materials give off toxic fumes that can be harmful or fatal to people in the vicinity of the cutting area. Also, some solvents decompose and form harmful gases when exposed to ultraviolet radiation. These solvents should be removed from the area prior to cutting.

Galvanized metal can produce harmful gases during the cutting process. Ensure proper ventilation and use breathing equipment when cutting these materials.

Certain metals coated with or containing lead, cadmium, zinc, beryllium, and mercury produce harmful toxins. Do not cut these metals unless all people subjected to the fumes wear proper air breathing equipment.

Electric Shock Prevention

The FineLine 260PC system uses high open circuit voltages that can be fatal. Extreme care should be used when operating or performing maintenance on the system. Only qualified personnel should service the FineLine system. Observe the following guidelines to protect against electric shock:

- A wall-mounted disconnect should be installed and fused according to local and national electrical codes. The disconnect should be located as close as possible to the power supply so it can be turned off in case of an emergency.
- The primary power cord should have a 600 volt minimum rating in order to protect the operator. In addition, it should be sized according to local and national electrical codes. Inspect the primary power cord frequently. Never operate the FineLine system if the power cord is damaged in any way.
- Make sure the primary power ground wire is connected to the input power ground stud on the FineLine power supply. Make sure the connection is securely tightened.
- Make sure the positive output (work ground) of the FineLine power supply is connected to a bare metal area on the cutting table. A driven ground rod should be placed no further than five feet from this connection. Make sure this ground point on the cutting table is used as the star ground point for all other ground connections.
- Inspect the torch leads frequently. Never use the system if the leads are damaged in any way.
- Do not stand in wet, damp areas when operating or performing maintenance on the system.
- Wear insulated gloves and shoes while operating or performing maintenance on the system.
- Make sure the FineLine system is switched off at the wall disconnect before servicing the power supply or torch.
- Never change torch consumable parts unless the FineLine system is switched off at the wall disconnect.
- Do not attempt to remove any parts from beneath the torch when cutting. Remember that the workpiece forms the current path back to the power supply.
- Never bypass the safety interlock devices.
- Before removing any of the FineLine covers, switch the system off at the wall disconnect. Wait at least five (5) minutes before removing any cover. This

will give the capacitors inside the unit time to discharge.
- Never operate the FineLine system without all of the covers in place.
- Preventive maintenance should be performed daily to avoid possible safety hazards.

Fire Prevention

When using the FineLine 260PC system, it is necessary to exercise good judgment. While cutting, the arc produces sparks that could cause a fire should they fall on flammable material. Make sure that all flammable material, such as paper, cloth, etc., is a suitable distance away from the cutting area. All flammable liquids should be at least 40 feet away from the cutting area, preferably stored in a metal cabinet. Plasma cutting should never be attempted on containers that contain flammable materials. Make sure that fire extinguishers are readily accessible in the cutting area.

Make sure that the cutting area is properly ventilated when using oxygen as a cutting gas.

Explosion Prevention

The FineLine 260PC system uses compressed gases. Use proper techniques when handling compressed gas cylinders and other compressed gas equipment. Observe the following guidelines to protect against explosion:

- Never operate the FineLine system in the presence of explosive gases or other explosive materials.
- Never cut pressurized cylinders or any closed container.
- When using a water table and cutting aluminum under water or with water touching the underside of the aluminum plate, hydrogen gas is produced. This hydrogen gas may collect under the plate and explode during the cutting process. Make sure the water table is properly aerated to help prevent the accumulation of hydrogen gas.
- Handle all gas cylinders in accordance with safety standards published by the U.S. Compressed Gas Association (CGA), American Welding Society (AWS), Canadian Standards Association (CSA), or other local or national codes.
- Compressed gas cylinders should be maintained properly. Never attempt to use a cylinder that is leaking, cracked, or has other signs of physical damage.
- All gas cylinders should be secured to a wall or rack to prevent accidental knock over.
- If a compressed gas cylinder is not being used, replace the protective valve cover.
- Never attempt to repair compressed gas cylinders.
- Keep compressed gas cylinders away from intense heat, sparks, or flames.

- Clear the compressed gas cylinder connection point by opening the valve momentarily prior to installing a regulator.
- Never lubricate compressed gas cylinder valves or pressure regulators with any type of oil or grease.
- Never use a compressed gas cylinder or pressure regulator for any purpose other than which it is intended.
- Never use a pressure regulator for any gas other than which it is intended.
- Never use a pressure regulator that is leaking or has other signs of physical damage.
- Never use oxygen hoses and pressure regulators for any gas other than oxygen.
- Never use any gas hose that is leaking or has other signs of physical damage.

Health Support Equipment

The FineLine 260PC system creates electric and magnetic fields that may interfere with certain types of health support equipment, such as pacemakers. Any person who uses a pacemaker or similar item should consult a doctor before operating, observing, maintaining, or servicing the FineLine system. Observe the following guidelines to minimize exposure to these electric and magnetic fields:

- Stay as far away from the FineLine power supply, torch, torch leads, and remote high frequency console as possible.
- Route the torch leads as close as possible to the work ground cable.
- Never place your body between the torch leads and work ground cable. Keep the work ground cable and the torch leads on the same side of your body.
- Never stand in the center of a coiled up set of torch leads or work ground cable.

Safety Standards Booklet Index

For further information concerning safety practices to be exercised with plasma arc cutting equipment, please refer to the following publications:

1. AWS Standard AWN, *Arc Welding and Cutting Noise*, obtainable from the American Welding Society, 550 NW LeJeune Road, Miami, FL 33126.

2. AWS Standard C5.2, *Recommended Practices for Plasma Arc Cutting*, obtainable from the American Welding Society, 550 NW LeJeune Road, Miami, FL 33126.

3. AWS Standard FSW, *Fire Safety in Welding and Cutting*, obtainable from the American Welding Society, 550 NW LeJeune Road, Miami, FL 33126.

4. AWS Standard F4.1, Recommended *Safe Practices for Preparation for Welding and Cutting of Containers and Piping*, obtainable from the American Welding Society, 550 NW LeJeune Road, Miami, FL 33126.

5. AWS Standard ULR, *Ultraviolet Reflectance of Paint*, obtainable from the American Welding Society, 550 NW LeJeune Road, Miami, FL 33126.

6. AWS / ANSI Standard Z49.1, *Safety in Welding, Cutting, and Allied Processes*, obtainable from the American Welding Society, 550 NW LeJeune Road, Miami, FL 33126.

7. ANSI Standard Z41.1, *Standard For Men's Safety-Toe Footwear*, obtainable from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036.

8. ANSI Standard Z49.2, *Fire Prevention in the Use of Cutting and Welding Processes*, obtainable from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036.

9. ANSI Standard Z87.1, *Safe Practices For Occupation and Educational Eye and Face Protection*, obtainable from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036.

10. ANSI Standard Z88.2, *Respiratory Protection*, obtainable from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036.

11. OSHA Standard 29CFR 1910.252, *Safety and Health Standards*, obtainable from the U.S. Government Printing Office, Washington, D.C. 20402.

12. NFPA Standard 51, *Oxygen - Fuel Gas Systems for Welding, Cutting, and Allied Processes*, obtainable from the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269.

13. NFPA Standard 51B, *Cutting and Welding Processes*, obtainable from the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269.

14. NFPA Standard 70, *National Electrical Code*, obtainable from the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269.

15. CGA booklet P-1, *Safe Handling of Compressed Gases in Containers*, obtainable from the Compressed Gas Association, 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202.

16. CGA booklet P-14, *Accident Prevention in Oxygen-Rich and Oxygen-Deficient Atmospheres*, obtainable from the Compressed Gas Association, 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202.

17. CGA booklet TB-3, *Hose Line Flashback Arrestors*, obtainable from the Compressed Gas Association, 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202.

18. CSA Standard W117.2, *Safety in Welding, Cutting, and Allied Processes*, obtainable from Canadian Standards Association, 178 Rexdale Boulevard, Toronto, Ontario M9W lR3, Canada.

19. Canadian Electrical Code Part 1, *Safety Standard for Electrical Installations,* obtainable from the Canadian Standards Association, 178 Rexdale Boulevard, Toronto, Ontario M9W 1R3, Canada.

Section 2 Specifications

System Description

The FineLine 260PC is a microprocessor controlled, 275 amp, 100% duty cycle high current density plasma cutting and marking system. It utilizes a precision, dual gas torch that is capable of cutting mild steel up to 2" thick and stainless steel up to 1-1/2" thick. The FineLine 260PC is equipped with a computer controlled automatic gas console with VGA display. All cutting parameters are controlled from the automatic gas console. Setting up a cut is as simple as entering the material type, material thickness, and process (cutting or marking). All gas types and pressures are set automatically and the cutting parameters are transmitted to the FineLine power supply. Switching to a different screen on the gas console gives the operator a pictorial view of the torch parts required to make the cut. Another screen shows the recommended cutting speed and torch height for making the cut. These parameters can even be transmitted to an x/y machine controller or an arc voltage control system via RS-422 serial communication. The RS-422 port also allows for full control of the cutting parameters from an x/y machine controller. The gas console also tracks the number of cuts made with a particular set of consumables and keeps a detailed record of errors that may occur during the cutting sequence. To aid in troubleshooting, a message screen on the gas console displays all power supply and gas console sequencing. All gas inlets and outlets are connected to the rear of the automatic gas console. For cutting mild steel, the FineLine 260PC uses oxygen for the plasma gas and either oxygen or air for the shielding gas. When cutting stainless steel or other non-ferrous materials, air or H17 (17.5% hydrogen, 32.5% argon, 50% nitrogen) is used for the plasma gas and either air or nitrogen is used for the shielding gas. Air or nitrogen is used for the preflow and postflow gases.

The FineLine 260PC is technologically advanced to produce the highest quality cuts while maximizing consumable life. The torch is water-cooled and consumables are machined to exacting dimensions and checked with the latest computerized coordinate measuring systems. Eight nozzle sizes (30, 50, 70, 100, 150, 200, 260 and 275 amps) are available to produce excellent cut quality throughout the cutting range.

System Components

The FineLine 260PC consists of the following components:

Standard Components

- Power Supply
- Automatic Gas Console
- Remote High Frequency (RHF) Console
- RHF Console Control Cable
- Torch and Handle Assembly
- Torch Lead Set
- Torch Solenoid Valve Assembly
- Torch Solenoid Valve Control Cable
- Water and Power Leads
- Gas Hose Package
- Work Ground Lead
- System Manual
- Consumable Spare Parts Kit (see Section 8 for details)

Power Supply Specifications

Stock Number:
208 VAC, 3Ø, 60Hz 260410
230 VAC, 3Ø, 60Hz 260411
380 VAC, 3Ø, 50Hz 260412
415 VAC, 3Ø, 50Hz 260415
460 VAC, 3Ø, 60Hz 260414
575 VAC, 3Ø, 60Hz 260413

Input Current at Maximum Output:
208 VAC, 3Ø, 60Hz .....147 amps
230 VAC, 3Ø, 60Hz .....133 amps
380 VAC, 3Ø, 50Hz .....81 amps
415 VAC, 3Ø, 50Hz .....74 amps
460 VAC, 3Ø, 60Hz .....67 amps
575 VAC, 3Ø, 60Hz .....53 amps

Open Circuit Voltage ..... 325 VDC
Output Current ..... 8-275 amps
Maximum Output Voltage ..... 180 VDC
Duty Cycle ..... 100% @ 39 kW
Maximum Ambient Temperature ..... 104° F (40° C)

Dimensions:
- Width ..... 32.5 in (826 mm)
- Height (including AGC) ..... 48 in (1219 mm)
- Depth .....43 in (1092 mm)

Weight (including AGC) .....900 lb (408 kg)

Torch Cooling System:
- Discharge pressure .....150 psi (10.2 bar)
- Flow rate ..... 1 gal/min (3.8 liters/min)
- Coolant fluid ..... Propylene glycol/deionized water
- Coolant tank capacity .....3.2 gal (12 liters)

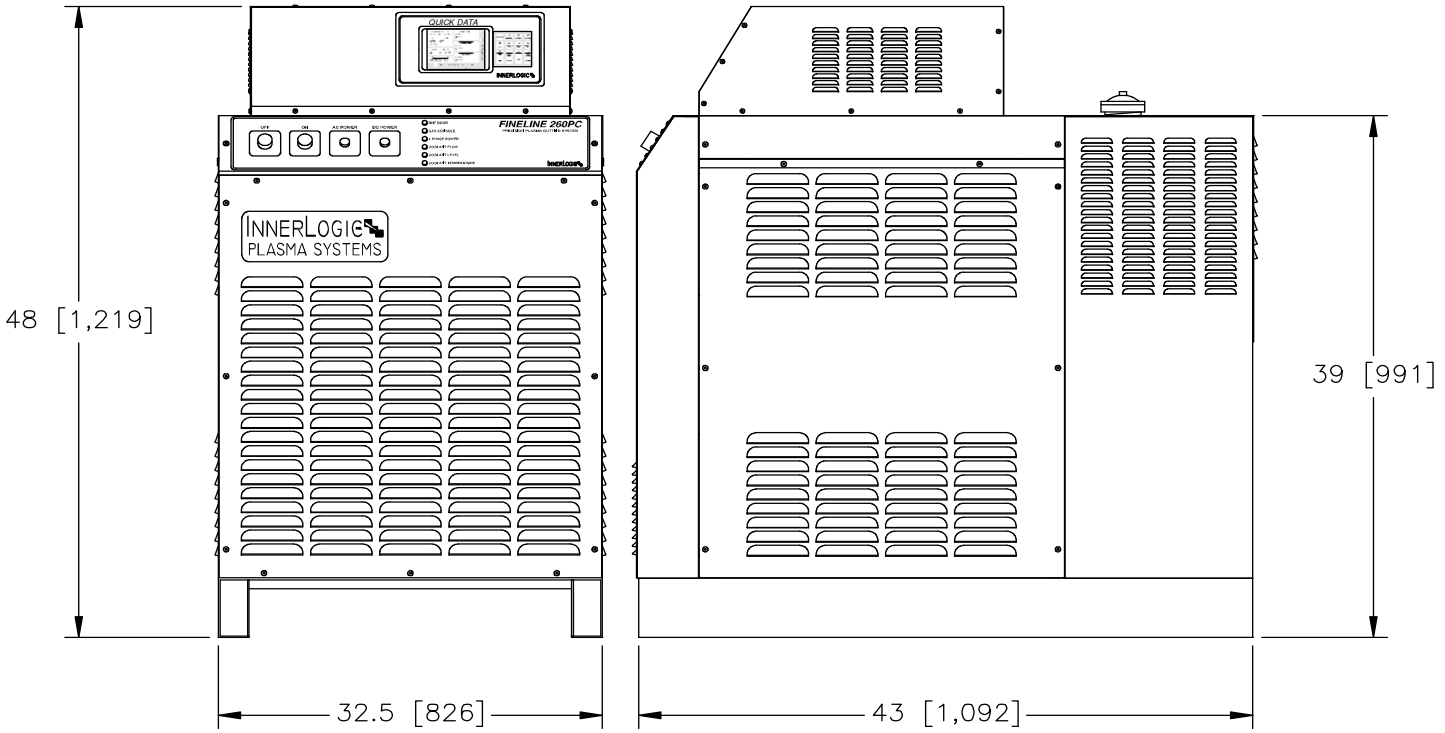

Figure 2-1 Power Supply Dimensions

Automatic Gas Console Specifications

Stock Number 260000
Height .....9 in (229 mm)
Width ..... 25 in (635 mm)
Depth .....23.8 in (605 mm)
Weight .....80 lb (36.2 kg)

Gas Supply Requirements

Plasma gas types:
- Mild Steel .....Oxygen or Air
- Stainless Steel ..... Air or H17 (optional)
- Aluminum ..... Air

Shield gas types:
- Mild Steel .....Oxygen or Air
- Stainless Steel ..... Air or Nitrogen
- Aluminum ..... Air or Nitrogen

Preflow gas type .....Air or Nitrogen

Plasma gas flow rate (maximum):
- Oxygen or Air ..... 67 scfh (1896 liters/hour)
- H17 .....40 scfh (1132 liters/hour)

Shield gas flow rate (maximum):
- Oxygen .....19 scfh (538 liters/hour)
- Air or Nitrogen .....160 scfh (4528 liters/hour)

Preflow gas flow rate (maximum) ..... 30 scfh (850 liters/hour)

Inlet gas pressures
- Oxygen .....120 psi (8.3 bar)
- Nitrogen ..... 120 psi (8.3 bar)
- Air ..... 120 psi (8.3 bar)
- H17 .....120 psi (8.3 bar)

Oxygen and nitrogen should be supplied with a purity of at least 99.5%. **A potential fire hazard exists when cutting with oxygen. Flashback arrestors must be supplied to prevent a possible fire from propagating back to the gas supplies.** Compressed air must be clean, dry, and oil-free and may be supplied from compressed cylinders or from an air compressor. Be aware that shop air systems are prone to oil and moisture contamination. If shop air is used, it must be cleaned to ISO 8573.1: Class 1.4.1. Specify dry air when using compressed cylinders. Breathing quality air contains moisture and must not be used.

1/4" (inside diameter) hoses are required for all inlet gas connections. Mating connectors are supplied with the unit. **Quick-connect fittings must not be used.**

Remote High Frequency Console Specifications

Stock Number 205500
Height .....5.35 in (136 mm)
Width ..... 13.5 in (343 mm)
Depth .....10 in (25 mm)
Weight .....22 lb (10 kg)
Spark gap distance ..... .025 in (.635 mm)

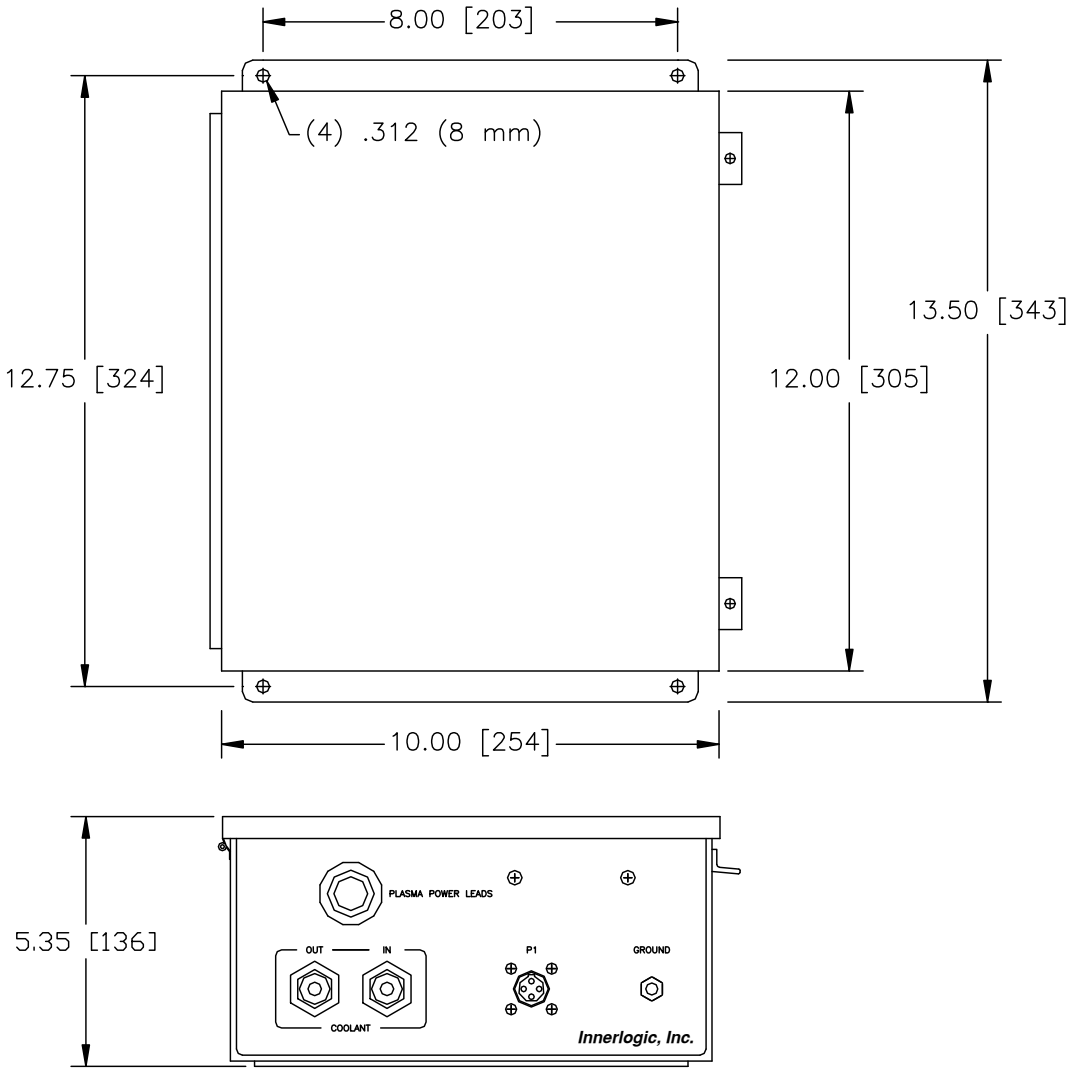

Figure 2-2 Remote High Frequency Console Mounting Dimensions

Torch Specifications

Stock Number:
- Torch main body 277000
- Torch handle assembly 820134

Diameter ..... 2 in (50.8 mm)

Length:
- Torch main body ..... 4.65 in (118 mm)
- Torch handle assembly / handle assembly ..... 13.85 in (352 mm)

Weight (including handle and valves) ..... 4 lb (1.8 kg)

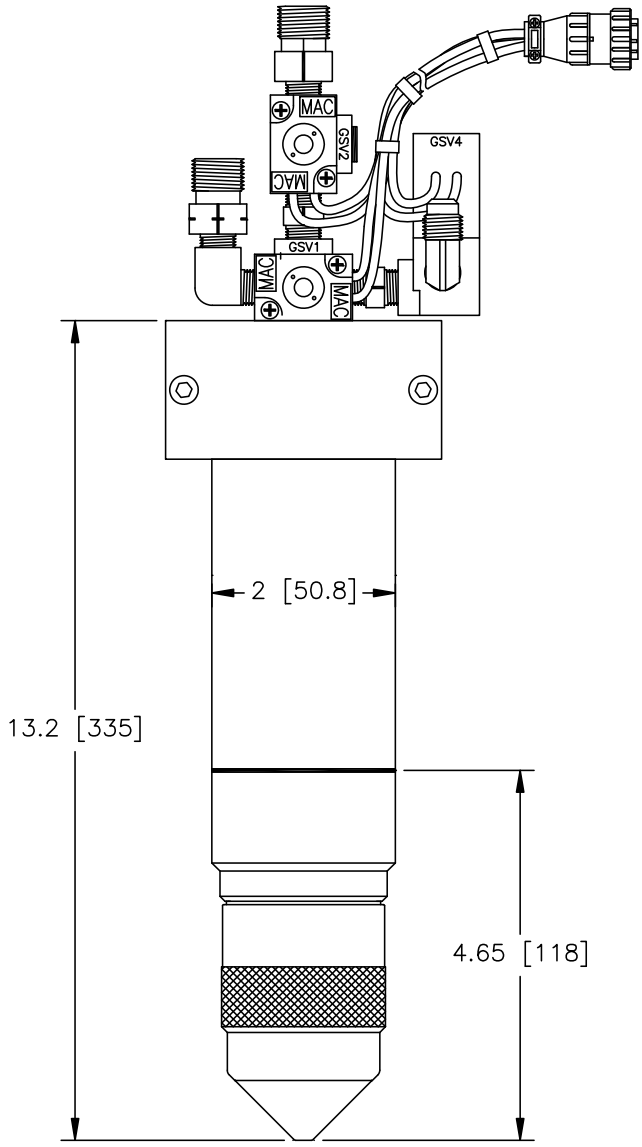

Figure 2-3 Torch Dimensions

Airborne Noise Emissions

The FineLine 260PC system generates high noise levels while cutting. Depending on the size of the cutting area, distance from the cutting torch, and arc current cutting level, acceptable noise levels may be exceeded. Proper ear protection should be used as defined by local or national codes. The following chart gives the noise levels generated by the FineLine 260PC when operating at 275 amps, 145 arc volts. The measurements were made with a sound level meter.

Distance From Torch	A-Weighted Sound Pressure Level	C-Weighted Sound Pressure Level
1 meter horizontal / 1.6 meters above the workpiece	110 dB	107 dB

The maximum noise level is 127 dB at a distance of 3 inches (76.2 mm) from the torch while cutting at 275 amps, 145 arc volts.

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Section 3 Installation

Initial Inspection

All systems undergo full testing before being shipped from KALIBURN. In the unlikely event that one of your components is defective or missing, please contact KALIBURN so a replacement item can be sent to you. Also, KALIBURN has taken special care in packaging your FineLine 260PC system. If your system was damaged during shipment, you will have to file a claim with the shipping company. Next, it will be necessary to contact KALIBURN so replacement parts can be ordered. If you need additional assistance, please contact KALIBURN.

System Interconnection

The FineLine 260PC system interconnection diagram, Figure 3-1, will assist you in identifying cables and hoses upon receipt of your system. Electrical cables are marked with the appropriate plug number or letter and can be identified on the diagram. The Inova arc voltage control is also shown to assist in its hookup.

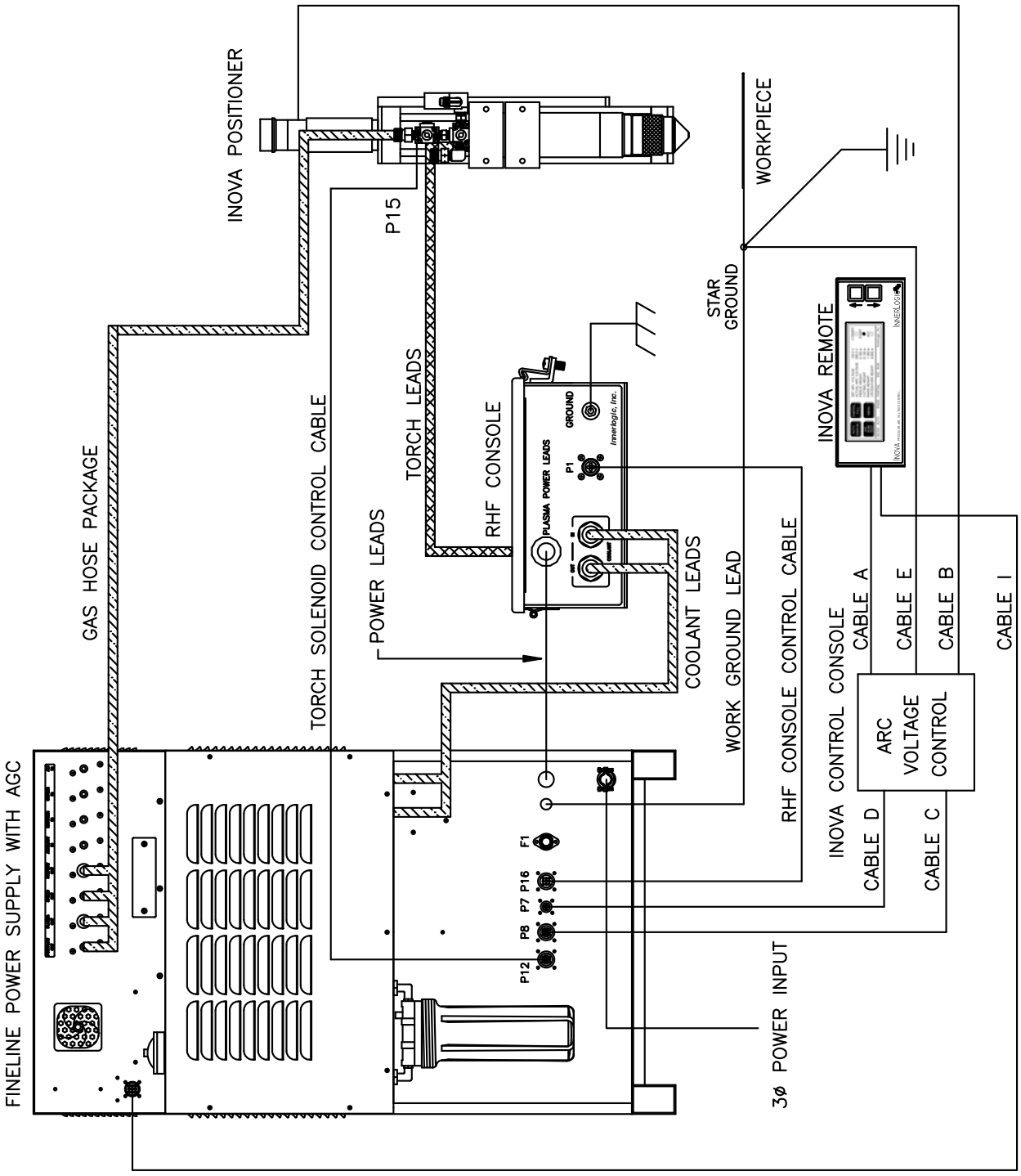

Figure 3-1 System Interconnection Diagram

Power Supply Installation

The FineLine power supply should be lifted by a forklift or pallet jack. In order to prevent damaging the power supply, the forks should be of adequate length to protrude on the far side of the power supply. The proper location of the power supply will provide dependable service and reduce periodic maintenance time. Choose a location that will provide unrestricted air movement into and out of the power supply. Maintain **at least 24 inches** of space on **all** sides of the unit. The location should subject the power supply to the least amount of dust, dirt, moisture, and corrosive vapors. The power supply must be cleaned as often as necessary to prevent the accumulation of metallic dust inside the unit. See Figure 2-1 for power supply dimensions.

Remote High Frequency Console Installation

The Remote High Frequency (RHF) Console should be mounted in a convenient location that is away from other electronic control devices. The high voltage, high frequency signal generated inside the unit can interfere with the operation of certain control systems. The RHF console is usually mounted on the gantry of the cutting machine or on the cutting table. See Figure 2-2 for RHF console mounting dimensions.

Torch Installation

The FineLine 260PC torch must be installed on the positioner of an arc voltage control capable of maintaining the cutting arc voltage within 1 arc volt. The arc voltage must be adjustable in 1 arc volt increments. The positioner must be rigid to ensure cut quality and a torch collision sensor is highly recommended. See Figure 2-3 for torch mounting dimensions.

Primary Power Connection

**** Before connecting primary power, check the data plate to verify the voltage required by the FineLine power supply ****

A primary disconnect switch should be provided for each FineLine power supply. The disconnect switch should be located as close as possible to the power supply so it can be turned off quickly in case of an emergency. **The disconnect switch should be equipped with time delay fuses only**. The magnetic inrush current of the power supply will cause fast acting fuses to blow. The disconnect switch should be sized according to local and national codes. The rating must meet or exceed the continuous rating of the fuses used. See the following chart for recommended fuse sizes:

3 Phase Input Voltage (VAC)	Input Current at Maximum Output (amps)	Recommended Time-Delay Fuse Size (amps)
208V 60Hz	147	200
230V 60Hz	133	190
380V 50Hz	81	125
415V 50Hz	74	100
460V 60Hz	67	95
575V 60Hz	53	75

Use a Type SO power cable to connect the primary power to the FineLine power supply. The power cable should have a 600 volt minimum rating and should be sized according to local and national codes. Route the power cable through the lower strain relief on the rear of the power supply and connect it to the input terminal block TB5 as shown in Figure 3-2. TB5 is located on the base of the power supply behind the left side cover. **Be sure to connect the primary ground cable to the ground stud on the input terminal block**.

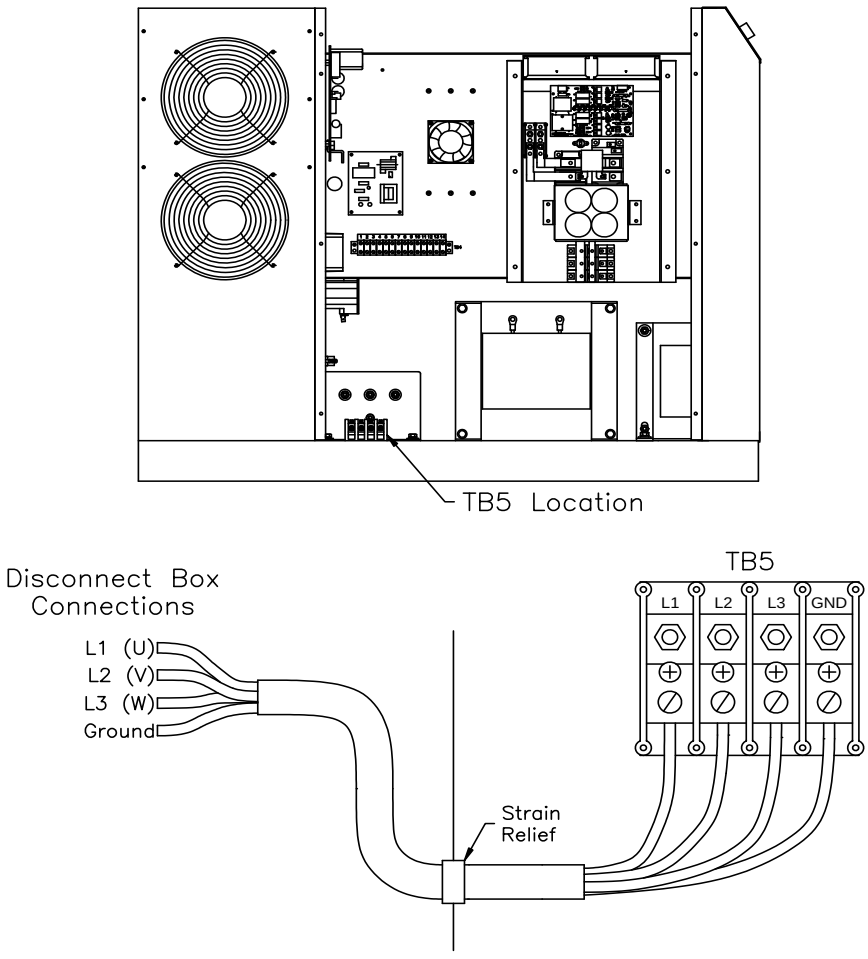

Figure 3-2 Primary Power Connections

Power Supply Output Connections

Perform the following steps to connect the output of the power supply to the RHF console and the work table. See Figure 3-3 for additional information.

Power Supply Electrode Lead (1)

1. Route one end of the #1/0AWG Power Supply Electrode Lead through the upper strain relief on the rear of the power supply and connect it to the Electrode terminal.
2. Route the other end of the Power Supply Electrode Lead through the strain relief on the RHF console and connect it to the cathode manifold.

Power Supply Nozzle Lead (2)

1. Route one end of the #10AWG Power Supply Nozzle Lead through the upper strain relief on the rear of the power supply and connect it to the Nozzle terminal.
2. Route the other end of the Power Supply Nozzle Lead through the strain relief on the RHF console and connect it to the Pilot terminal on the RHF console printed circuit board.

Power Supply CTP Sensor Lead (3)

1. Route the end of the #14AWG Power Supply CTP Sensor Lead with the ring terminal through the middle strain relief on the rear of the power supply and connect it to the CTP terminal.
2. Route the end of the Power Supply CTP Sensor Lead with the fast-on terminal through the strain relief on the RHF console and connect it to the CTP sensor lead filter assembly.

RHF Console Control Cable (4)

1. Connect the RHF Console Control Cable plug labeled P16 to the connector labeled P16 on the rear of the power supply.
2. Connect the RHF Console Control Cable plug labeled P1 to the connector labeled P1 on the RHF console.

Power Supply Coolant Supply Hose (5)

1. Connect one end of the Power Supply Coolant Supply Hose to the coolant supply fitting on the rear of the power supply. Note that the coolant supply fitting has right hand threads.
2. Connect the other end of the Power Supply Coolant Supply Hose to the coolant in fitting on the RHF console. Note that the coolant in fitting has right hand threads.

Power Supply Coolant Return Hose (6)

1. Connect one end of the Power Supply Coolant Return Hose to the coolant return fitting on the rear of the power supply. Note that the coolant return fitting has left hand threads.
2. Connect the other end of the Power Supply Coolant Return Hose to the coolant out fitting on the RHF console. Note that the coolant out fitting has left hand threads.

Work Ground Lead (7)

1. Route one end of the #1/0AWG Work Ground Lead through the middle strain relief on the rear of the power supply and connect it to the Work terminal.
2. Connect the other end of the Work Ground Lead to the star ground point on the cutting table. The star ground point is generally referred to as the common ground point on the cutting table where all subsystems of the machine are grounded. This point is then connected to a driven earth ground rod that should be as close as possible to the star ground. The ground rod should have no other wires connected to it. The ground rod should be at least 3/4 inches in diameter and should be driven into the earth's permanent moisture layer. The length of the ground rod varies from installation to installation and should be installed according to local and national codes. Refer to the National Electrical Code, Article 250, Section H, Ground Electrode System for additional information.

RHF Console Ground Connection (8)

Perform the following steps to connect the chassis of the RHF Console to the cutting table. See Figure 3-3 for additional information.

1. Connect one end of the RHF Console Ground Lead to the ground stud on the RHF console.
2. Connect the other end of the RHF Console Ground Lead to chassis ground on the cutting table. Make sure that good metal-to-metal contact is made.

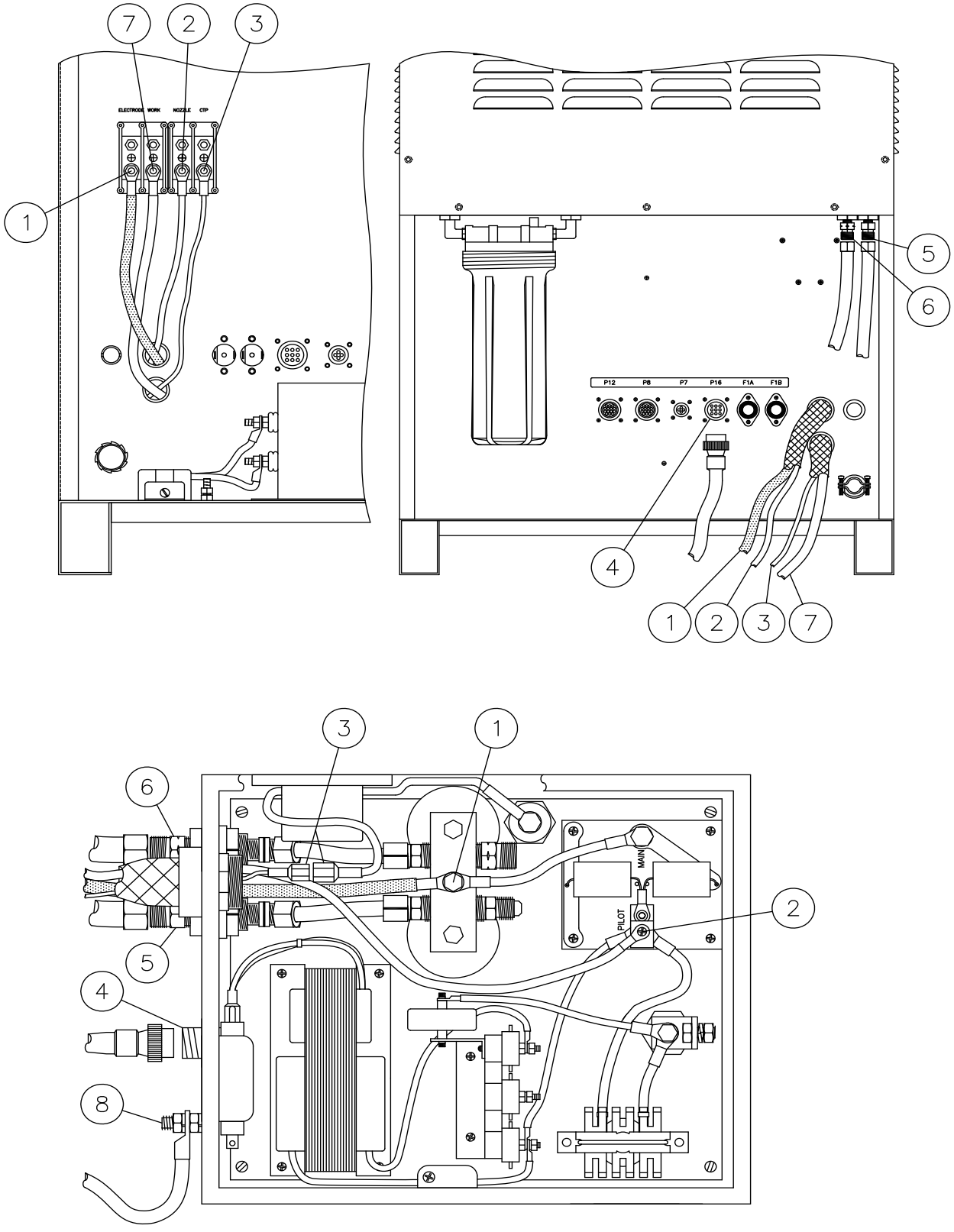

Figure 3-3 Power Supply Output Connections

Torch Leads to RHF Console Connections

Perform the following steps to connect the torch leads to the RHF console. See Figure 3-4 for additional information.

Note: When making hose connections, only tighten the brass fittings enough to make water or gas seals. The fittings are subject to damage if over tightened.

Braided Shield (9)

1. Remove the threaded ring from the brass shield connector on the end of the braided shield. Route the torch leads through the opening in the RHF console and push the shield connector through the hole until it is seated against the side of the console.
2. Slide the threaded ring over the torch leads, thread it onto the brass shield connector, and **tighten firmly**. The shield connector should ground the braided shield to the case of the RHF console in order to help reduce high frequency noise emission. Using an ohmmeter, measure for zero ohms between the braided shield and the ground stud located on the outside of the RHF console.

Torch Electrode/Coolant Supply Lead (10)

- Connect the Torch Electrode/Coolant Supply Lead to the brass cathode manifold. Note that the Torch Electrode/Coolant Supply Lead has right hand threads.

Torch Coolant Return Lead (11)

- Connect the Torch Coolant Return Lead to the brass cathode manifold. Note that the Torch Coolant Return Lead has left hand threads.

Torch Nozzle Lead (12)

- Connect the #14AWG Torch Nozzle Lead to the angled bracket on the red standoff.

Torch CTP Sensor Lead (13)

- Connect the #18AWG Torch CTP Sensor Lead to the red standoff as shown.

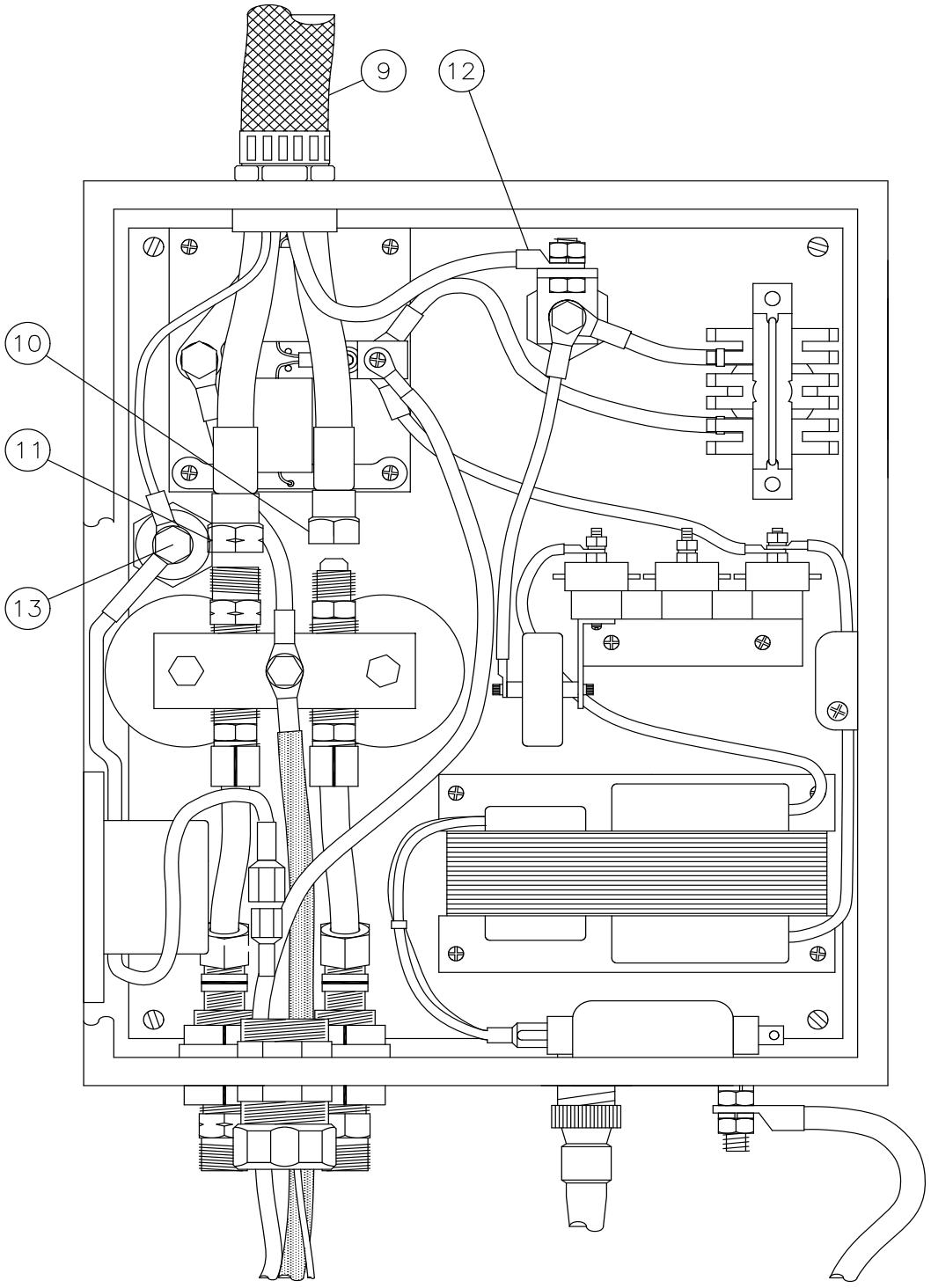

Figure 3-4 Torch Leads to RHF Console Connections

Torch Connections

Perform the following steps to connect the torch leads and gas hoses to the torch and torch solenoid assembly. See Figure 3-5 for additional information.

Note: When making hose connections, only tighten the brass fittings enough to make water or gas seals. The fittings are subject to damage if over tightened. Also, use two wrenches when tightening the torch fittings to avoid damaging the torch

Gas Hose Package/Torch Solenoid Control Cable Installation

- Route the Plasma, Shield, Preflow, and Postflow Gas Hoses and the Torch Solenoid Control Cable from the power supply to the torch station. Note that the Shield Gas Hose extends down inside the torch handle, so it should be routed accordingly. Also, plug P12 on the Torch Solenoid Control Cable attaches at the power supply and P15 attaches to the torch solenoid assembly.

Torch Handle Installation

1. Route the torch leads through the torch handle. Note that the threaded end of the torch handle mates with the torch.
2. Route the Shield Gas Hose through the torch handle.
3. Route the 15" Torch Plasma Gas Hose through the torch handle. Note that the larger fitting on the Torch Plasma Gas Hose mates with the torch.

Torch Electrode/Coolant Supply Lead (10)

- Connect the Torch Electrode/Coolant Supply Lead to the torch as shown.

Torch Coolant Return Lead (11)

- Connect the Torch Coolant Return Lead to the torch as shown. Note that the Torch Coolant Return Lead fitting has left hand threads.

Torch Nozzle Lead (12)

- Connect the Torch Nozzle Lead to the torch as shown.

Torch CTP Sensor Lead (13)

- Connect the Torch CTP Sensor Lead to the torch as shown.

Shield Gas Hose (14)

- Connect the Shield Gas Hose to the torch as shown.

Torch Plasma Gas Hose (15)

- Connect the Torch Plasma Gas Hose to the torch as shown.

Torch to Torch Handle Installation

1. Thread the torch handle onto the torch body.
2. Attach the solenoid valve assembly to the torch handle. The top of the aluminum solenoid bracket should be flush with the top of the torch handle.

Torch Plasma Gas Hose (16)

- Connect the Torch Plasma Gas Hose to the solenoid outlet port as shown.

Preflow Gas Hose (17)

- Connect the Preflow Gas Hose to the solenoid preflow inlet port as shown. Note that the Preflow Gas Hose fitting has left hand threads.

Plasma Gas Hose (18)

- Connect the Plasma Gas Hose to the solenoid plasma inlet port as shown.

Postflow Gas Hose (19)

- Connect the Postflow Gas Hose to the solenoid postflow inlet port as shown.

Torch Solenoid Control Cable (20)

- Connect the Torch Solenoid Control Cable plug marked P15 to the torch solenoid assembly as shown. Connect the Torch Solenoid Control Cable plug labeled P12 to the connector labeled P12 on the rear of the power supply.

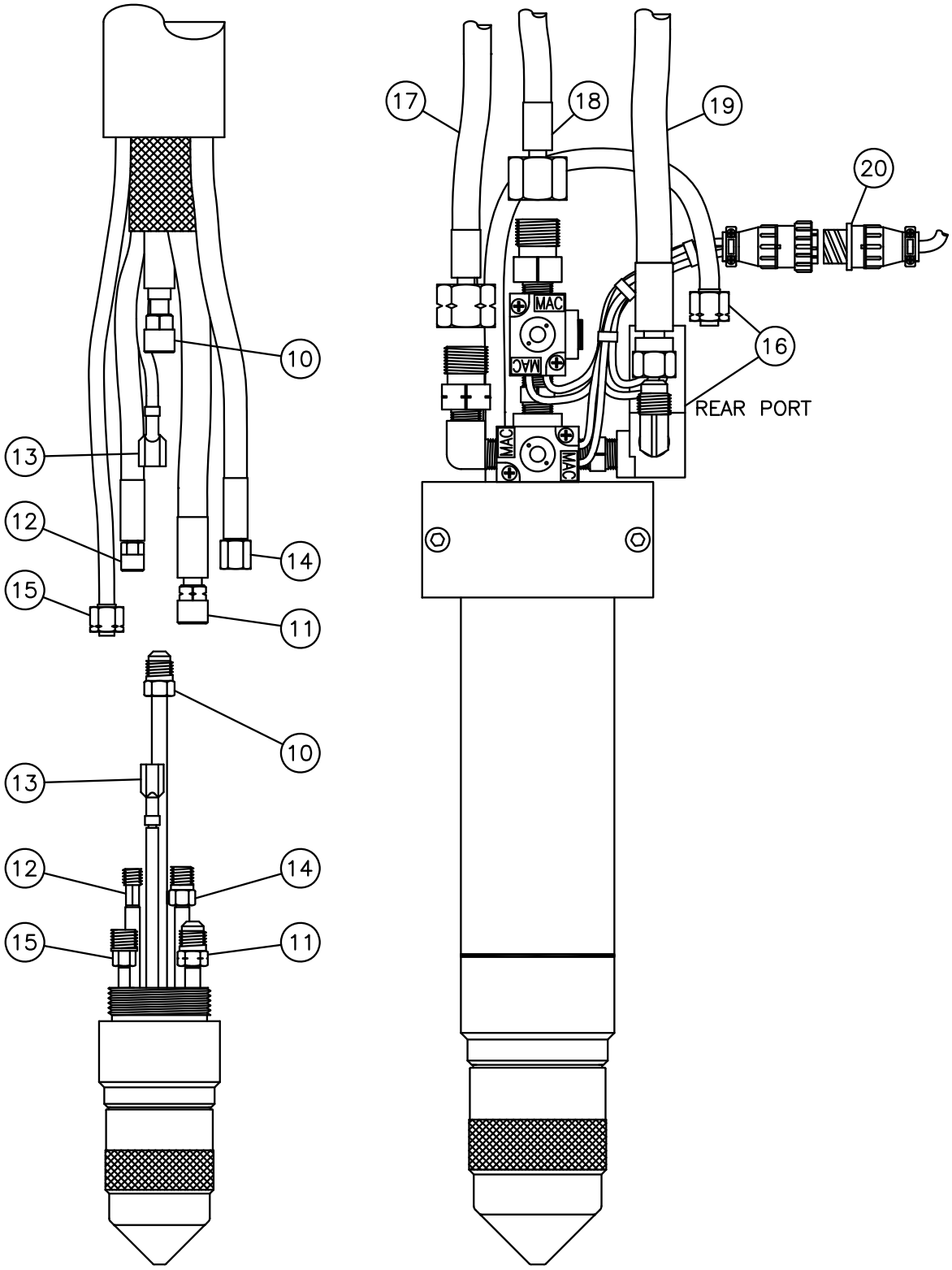

Figure 3-5 Torch Connections

Automatic Gas Console Input Connections

Perform the following steps to connect the gas supply lines to the automatic gas console. See Section 2 for gas supply requirements. Mating hose barbs and connectors are supplied with the system and are sized for 1/4 inch inside diameter hose. **Do not change the inlet gas supply fittings to quick-connect fittings. Using quick-connect fittings to connect and disconnect pressurized hoses may cause damage to the system.**

Note: When making hose connections, only tighten the brass fittings enough to make gas seals. The fittings are subject to damage if over tightened.

Air Inlet (21)

- Air must be supplied to the unit at all times, regardless of the cutting current or material type.

Oxygen Inlet (22)

- Oxygen must be supplied to the unit when mild steel is being cut.

Nitrogen Inlet (23)

- Nitrogen must be supplied to the unit when aluminum is being cut or stainless steel is being cut at 50, 70, 100, 150, 200, or 260 amps.

Auxiliary Inlet (24)

- The auxiliary inlet is reserved for future use.

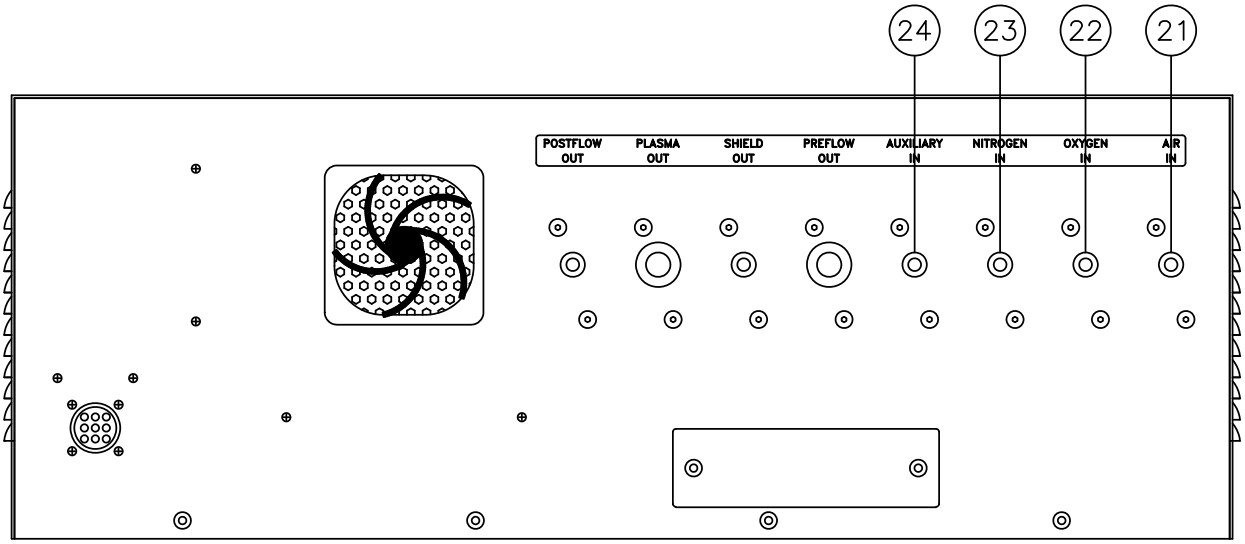

Figure 3-6 Automatic Gas Console Input Connections

Automatic Gas Console Output Connections

Perform the following steps to connect the automatic gas console outputs to the torch gas hoses.

Note: When making hose connections, only tighten the brass fittings enough to make gas seals. The fittings are subject to damage if over tightened.

Preflow Outlet (25)

- Connect the Preflow Hose to the preflow outlet as shown. Note that the preflow outlet has left hand threads.

Shield Outlet (26)

- Connect the Shield Hose to the shield outlet as shown. Note that the shield outlet has right hand threads.

Plasma Outlet (27)

- Connect the Plasma Hose to the plasma outlet as shown. Note that the plasma outlet has right hand threads.

Postflow Outlet (28)

- Connect the Postflow Hose to the postflow outlet as shown. Note that the postflow outlet has right hand threads.

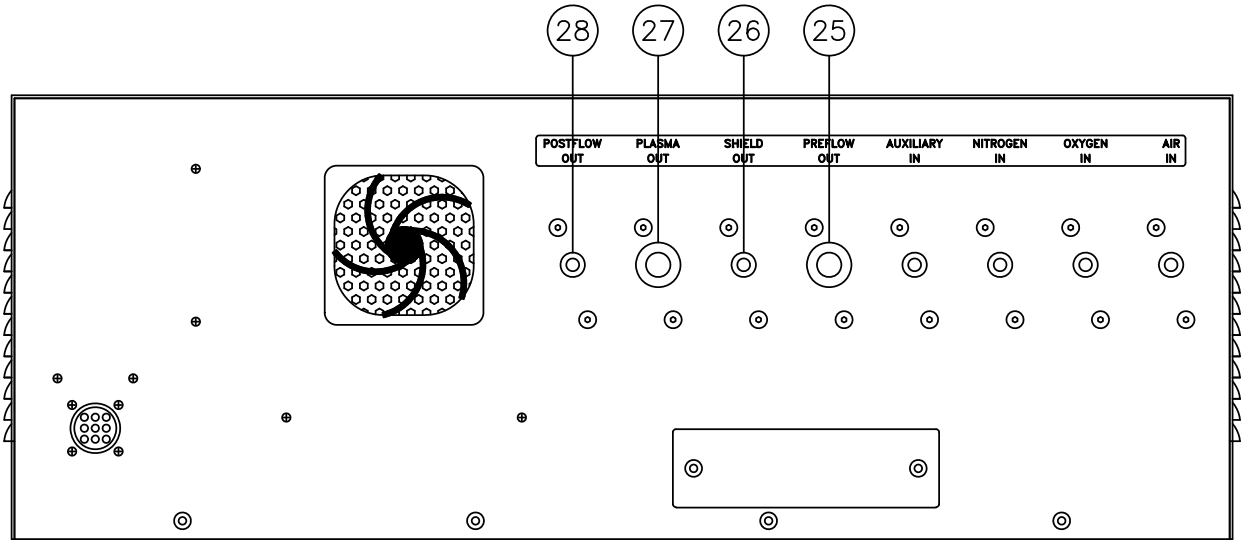

Figure 3-7 Automatic Gas Console Output Connections

CNC Machine Interface Connections

Perform the following steps to properly interface the FineLine 260PC system with a CNC cutting machine. See the system schematic for additional information.

Plasma Start Signal

- The FineLine 260PC requires a contact closure between P8 pins 3 and 4 to commence the cutting sequence. The cutting sequence is terminated when the contacts are opened. The contacts should be rated for 12VDC - 10mA.

Arc Hold / IHS Complete Signal

- The FineLine 260PC requires a contact closure between P8 pins 10 and 11 to inhibit arc starting even though a plasma start signal has been applied to the unit. When the arc hold / IHS complete contacts are opened, the cutting arc is initiated. This feature is used to decrease cycle time by allowing pre-cut gas and contact sequencing to occur simultaneously with initial torch height positioning. The contacts should be rated for 12VDC - 10mA.

Motion Output Signal

- The FineLine 260PC provides a maintained contact closure output between P8 pins 12 and 14 as long as a cutting arc is maintained between the torch and the workpiece. The motion contacts are rated for .6A - 125VAC / .6A - 110VDC / 2A - 30VDC.

RS-422 Serial Communication Link

- An RS-422 serial communication link can be connected between the plug on the rear of the automatic gas console and a CNC machine or automatic height control system. All cutting parameters can be controlled via the RS-422 communication link. Also, cutting information such as pierce height, cutting height, recommended arc voltage, and recommended cutting speed can be transmitted from the automatic gas console to the CNC machine or height control. See Section 6 for additional information.

Torch Coolant Requirements

Note: Refer to the Material Safety Data Sheet in Appendix A for information regarding safety, handling, and storage of propylene glycol.

The FineLine 260PC system is shipped without torch coolant in the reservoir. Coolant must be added before applying power to the system. **Only use the recommended FineLine torch coolant solution**. Commercially available antifreeze contains corrosion inhibitors that will damage the cooling system. The FineLine torch coolant solution will maintain optimal system performance. The standard coolant solution consists of 25% industrial grade propylene glycol and 75% deionized water and can be ordered in one-gallon containers, PN 500695.

This solution provides freezing protection down to -13º C (9º F). For operating temperatures below -13º C, the concentration of propylene glycol in the coolant solution must be increased. See Figure 3-8 to determine the percentage of propylene glycol required for the application. 100% propylene glycol can be ordered in one-gallon containers, PN 500720. **Failure to use the proper propylene glycol/deionized water solution may result in cooling system and/or torch damage**.

The torch coolant should be flushed out of the FineLine system every six months and replaced with new coolant. The water filter/deionization cartridge should also be changed at the same time. See Section 7 for details.

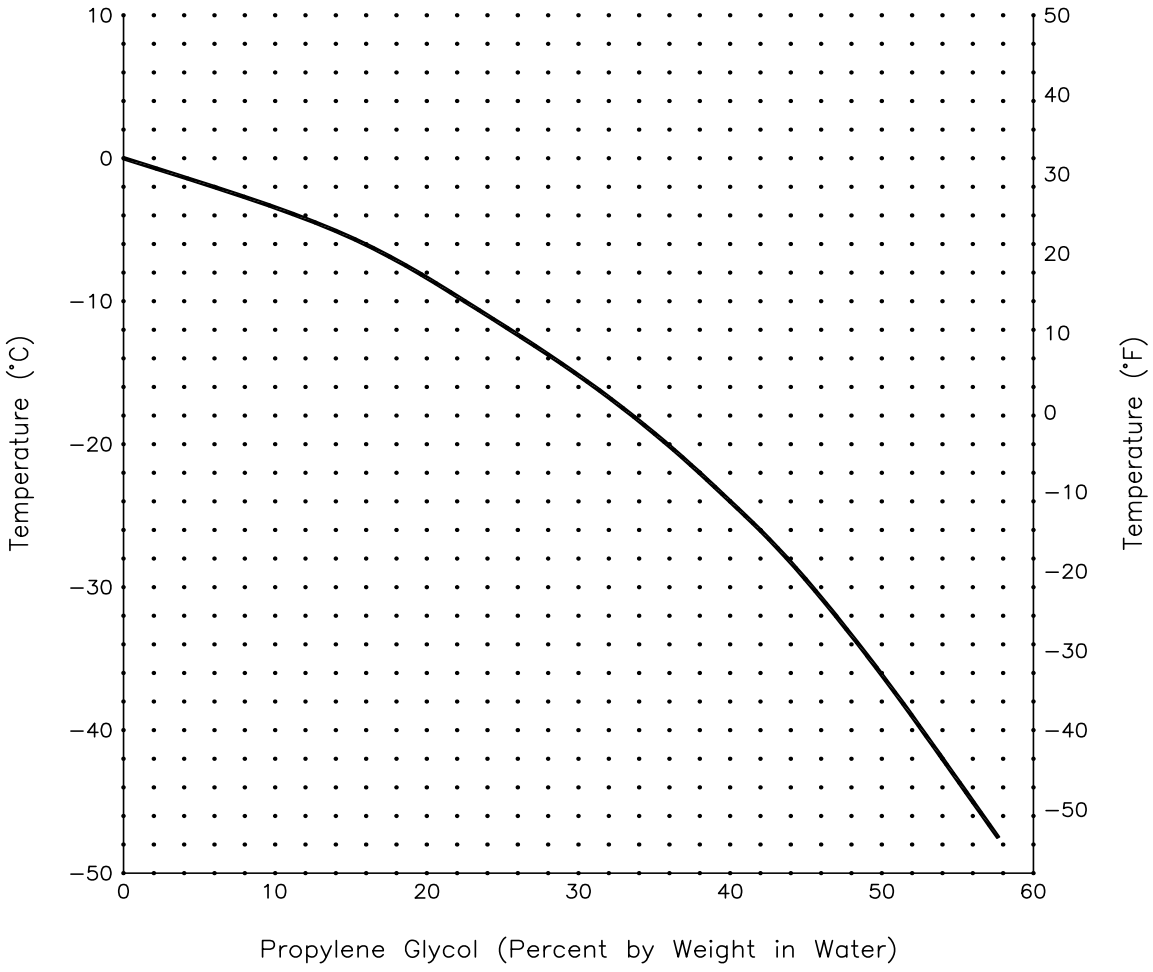

Figure 3-8 Freezing Points of Aqueous Propylene Glycol Solutions

Filling the Torch Coolant Reservoir

Note: Never turn on the power supply before filling the torch coolant reservoir with the proper coolant solution.

1. Remove the coolant reservoir cap and fill the reservoir with 2 gallons of coolant solution.

2. Apply main power to the FineLine unit.

3. Depress and hold the green ON button on the FineLine control panel.

4. The coolant pump will begin pumping coolant fluid through the system. The Coolant Flow LED will remain out until the coolant has filled the entire system and begins flowing back into the tank. The coolant pump will turn off if the coolant level drops below the minimum level inside the reservoir. If this happens, add more coolant solution to the reservoir and return to Step 3.

6. When the Coolant Flow LED illuminates, release the green ON switch. The FineLine system should remain energized and continue pumping coolant through the system.

7. Locate the small red push-button on top of the coolant filter/deionization cartridge. Depress and hold the button until no air is seen inside the clear filter housing.

8. Fill the reservoir with coolant solution until the coolant gauge indicates full. Coolant should be added to the system any time the level drops below half full.

9. Check for coolant leaks at all hose connections inside the power supply, RHF console, and at the torch.

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Section 4 Operation

Power Supply Front Panel Controls

All of the FineLine controls and status indicator lights are located on the front panel of the system. This section describes the function of each control and indicator. See Figure 4-1 for front panel control and indicator locations.

Power Off Button (1)
Deenergizes the FineLine system and turns off the cooling fans and coolant pump.

Power On Button/Indicator (2)
Energizes the FineLine system and turns on the cooling fans and coolant pump. Illuminates to show that the system is energized.

AC Power Indicator (3)
Illuminates when 3 phase power is applied to the FineLine system.

DC Power Indicator (4)
Illuminates when then main contactor has been energized and D.C. current is flowing through the torch.

Status Indicators (5)

- **RHF Door Indicator**
  Illuminates when the RHF console door is closed securely. Remains extinguished when the RHF console door is open.

- **Gas Console Indicator**
  Illuminates when the automatic gas console is operational. Remains extinguished when there is a problem with the gas system. Check the message screen on the automatic gas console for errors.

- **3 Phase Power Indicator**
  Illuminates when 3 phase power is satisfactory. Remains extinguished when there is a problem with main 3 phase power to the system.

- **Coolant Flow Indicator**
  Illuminates when the coolant flow through the system is satisfactory. Remains extinguished when the coolant flow through the system is restricted.

- **Coolant Level Indicator**
  Illuminates when the coolant level inside the reservoir is satisfactory. Remains extinguished when coolant must be added to the system.

- **Coolant Temperature Indicator**
  Illuminates when the torch coolant temperature is satisfactory. Remains extinguished when the coolant temperature is too hot. If the torch coolant indicator goes out, leave the unit energized until it illuminates.

Automatic Gas Console Display (6)
Shows all of the power supply and gas console settings, errors, and sequencing.

Automatic Gas Console Keypad (7)
Operator interface to automatic gas console.

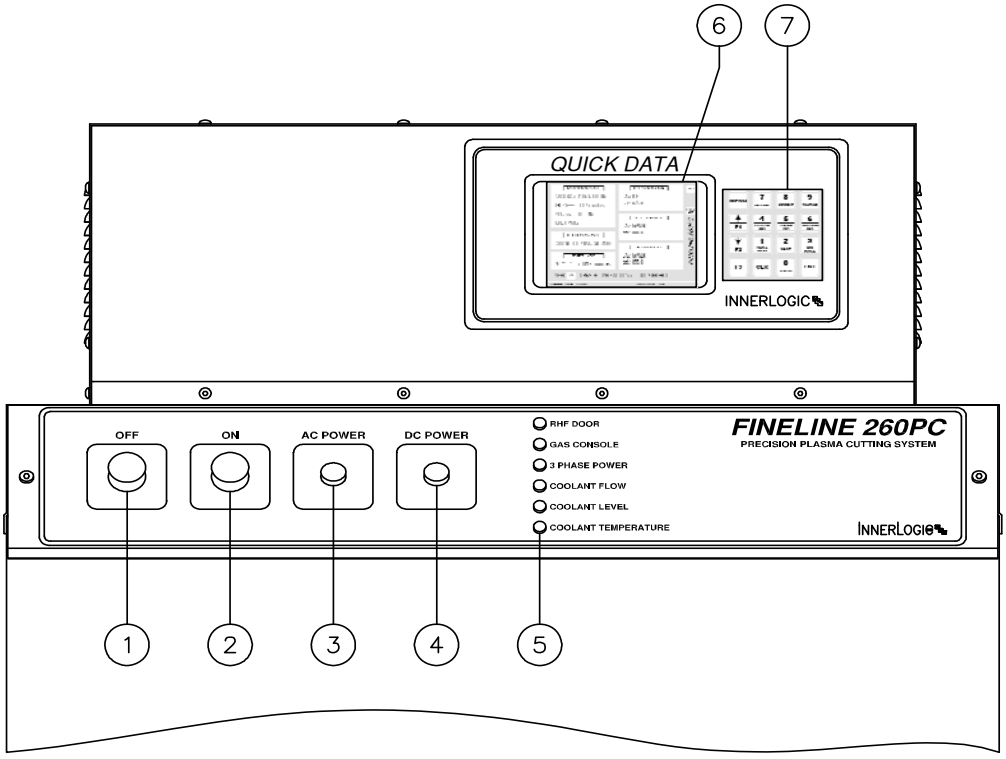


Figure 4-1 Front Panel Controls

Automatic Gas Console Keypad

All cutting information is entered on the keypad of the automatic gas console as shown in Figure 4-2. This section provides a description of each key and its function.

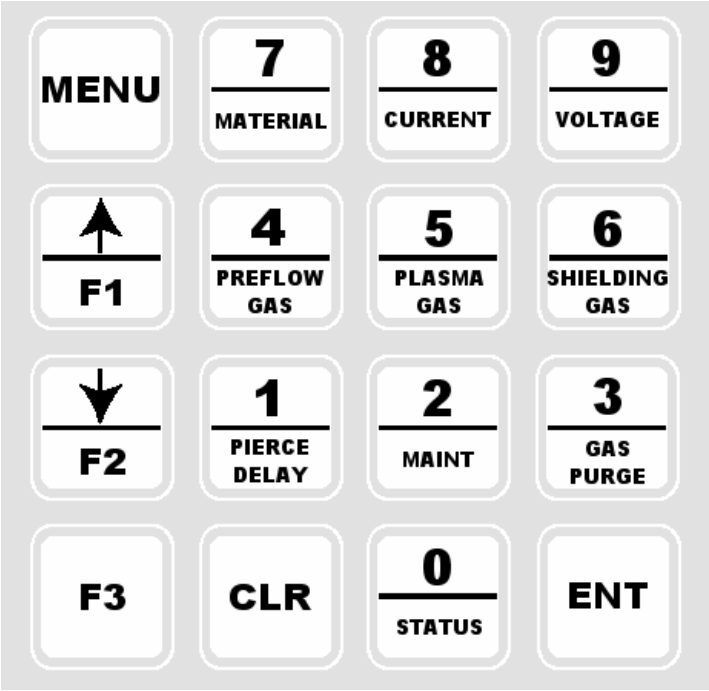


Figure 4-2 Automatic Gas Console Keypad

Menu Key

The Menu key is used to select the bottom portion of a split-level key. When the Menu key is pressed, a menu icon will appear in the upper right hand corner of the screen. Pressing the Menu key again will clear the icon and return to the previous mode. Pressing a split-level key while the menu icon is visible will enter the specified mode. The following is a list and description of menu key functions:

Menu + Material:	Enters the material-editing mode
Menu + Current:	Enters the current editing mode
Menu + Voltage:	Displays the voltage screen
Menu + Preflow Gas:	Enters the preflow gas-editing mode
Menu + Plasma Gas:	Enters the plasma gas-editing mode
Menu + Shield Gas:	Enters the shield gas-editing mode
Menu + Pierce Delay:	Enters the pierce delay-editing mode
Menu + Maint:	Enters the maintenance mode
Menu + Gas Purge:	Purges the cutting gases
Menu + Status:	Displays the main status screen

Arrow Keys
The Arrow keys are used to scroll up and down in order to edit or select a particular item.

Function Keys
The Function keys are used for various purposes in the editing and maintenance modes. The help prompt instructs the user on the use of the Function keys.

Numerical Keys
The Numerical keys are used for entering and editing parameters.

Automatic Gas Console Help Prompt

Help prompts are displayed on the automatic gas console screen to assist the user. Different screens may have more than one help prompt, but the help prompts will always appear near the bottom of the screen.

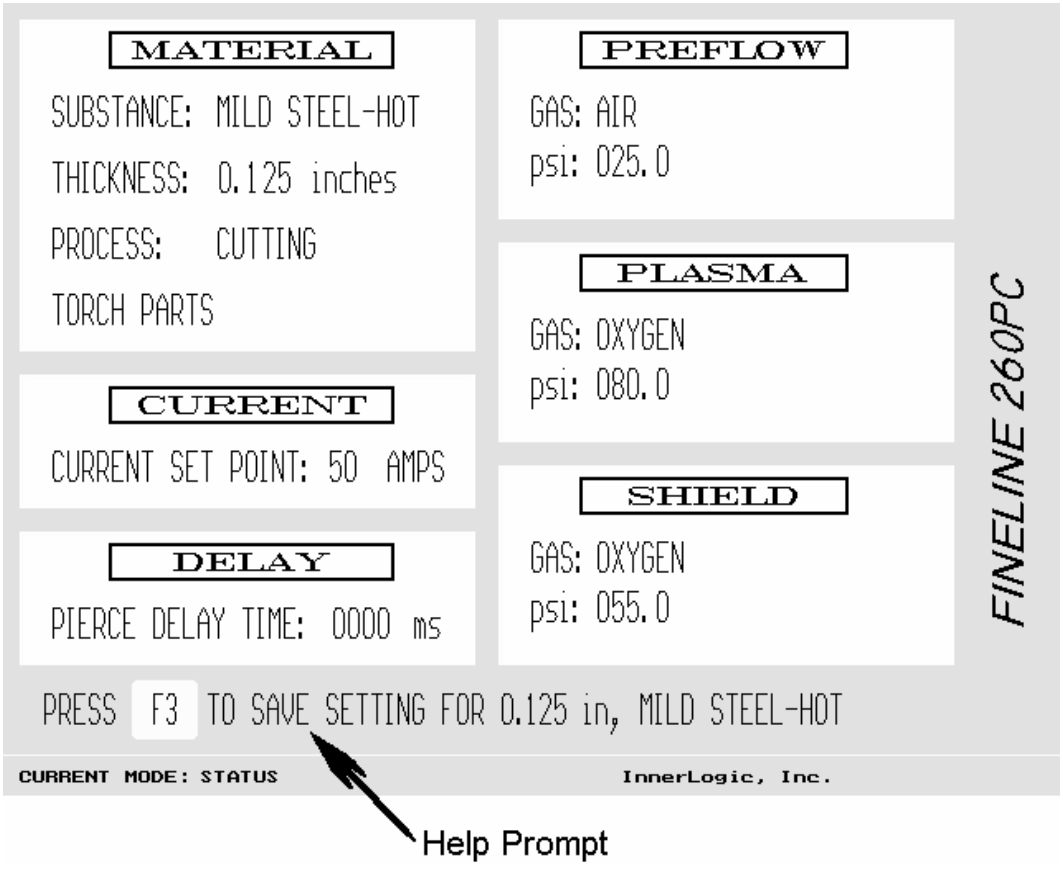


Figure 4-3 Help Prompt

Automatic Gas Console Status Screen

When the automatic gas console is in the status mode, the status screen is displayed as shown in Figure 4-4. The status screen displays all of the primary cutting parameters. To edit a parameter on the status screen, the arrow keys can be used to scroll through the different parameters or the Menu key can be used as described previously. Note that when the Menu key is pressed, the Menu icon appears in the upper right hand corner of the screen as shown. To return to the status mode from another mode, press the Menu key then the Status key. The status screen also displays the Please Wait icon while the gas pressures are being adjusted or when an error occurs with the gas system.

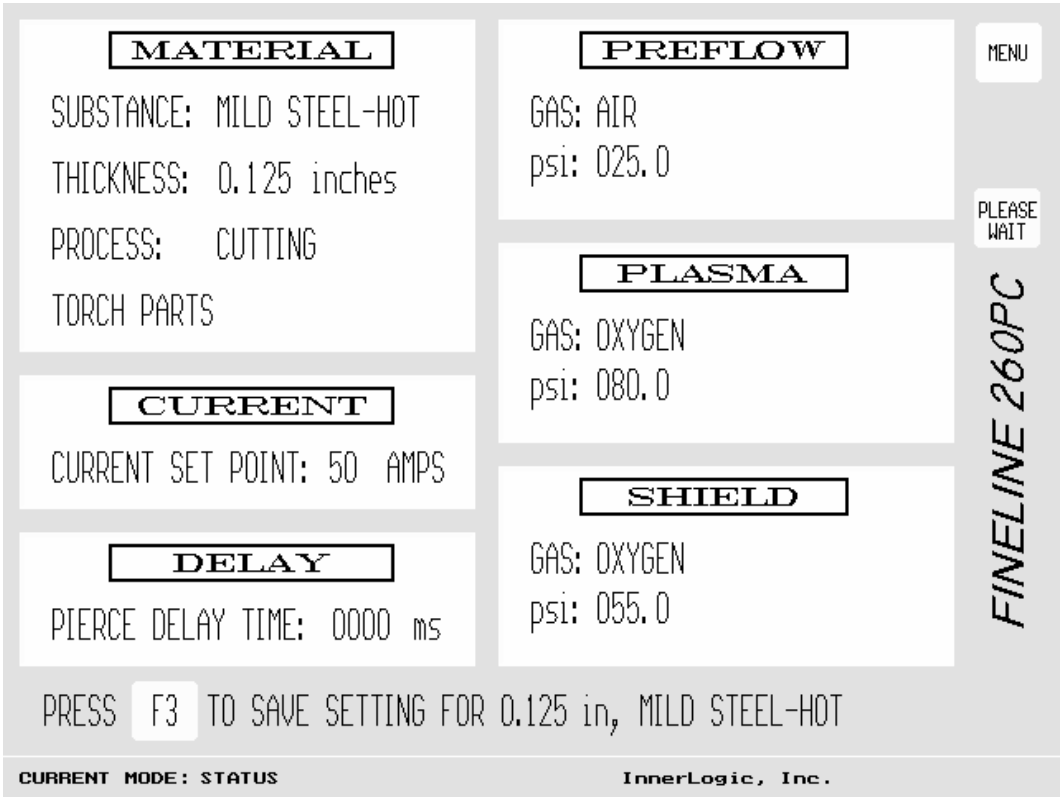


Figure 4-4 Status Screen

Setting up a Cut

The automatic gas console makes it very simple to set up the machine to make a cut. Selecting a material type, material thickness, and process (cutting or marking) are the only parameters that must be entered. All other parameters are adjusted automatically. Perform the following steps to enter the cutting data. See Section 5 for advanced functions of the automatic gas console.

Selecting Material Type

From the status mode, press the down arrow once to scroll down to substance, or press Menu, then Material. The substance area should be highlighted as shown in Figure 4-5 and the substance type should be blinking. To change the substance type, press F3 as indicated by the help prompt. Pressing F3 repeatedly will scroll through the list of possible substance choices. The available substance types are as follows:

- Mild Steel - Cold Rolled
- Mild Steel - Hot Rolled
- Stainless Steel
- Aluminum
- Other

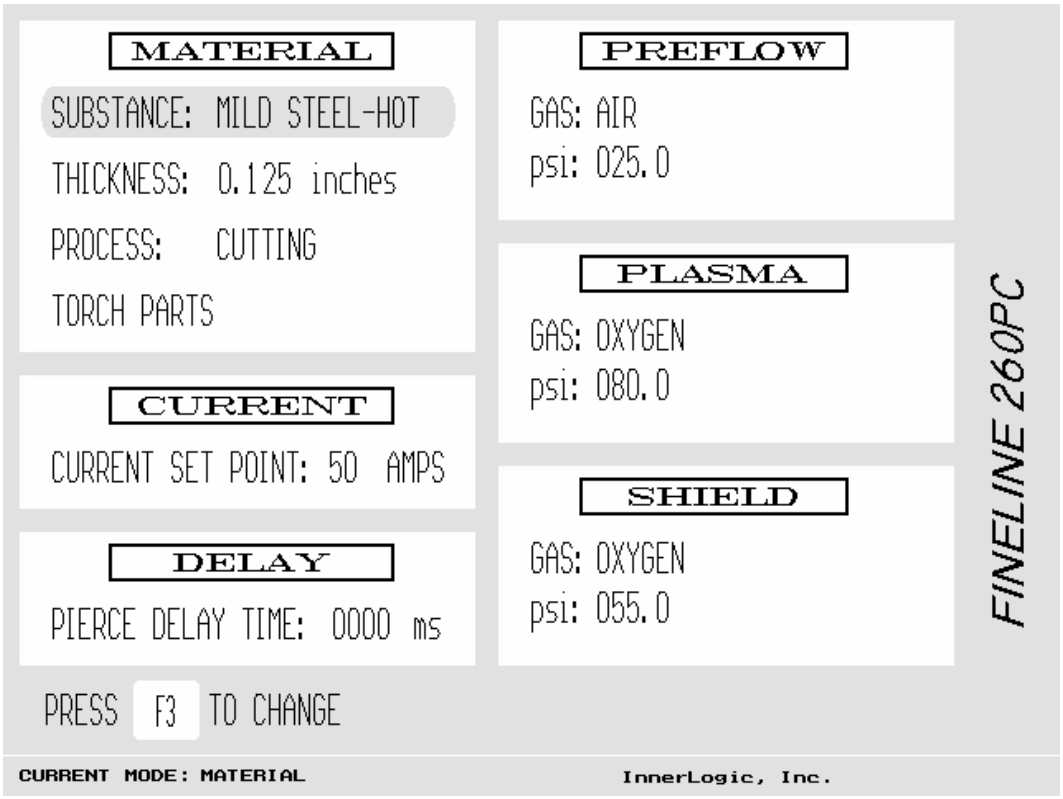


Figure 4-5 Selecting Material Substance

Setting Material Thickness

To set the material thickness, use the down arrow to scroll down to Thickness. The material thickness should be highlighted as shown in Figure 4-6 and the editing cursor should be blinking. Use the numerical keypad to enter the material thickness. Use the CLR key to backspace if an error is made. Press the enter key when the correct value has been entered.

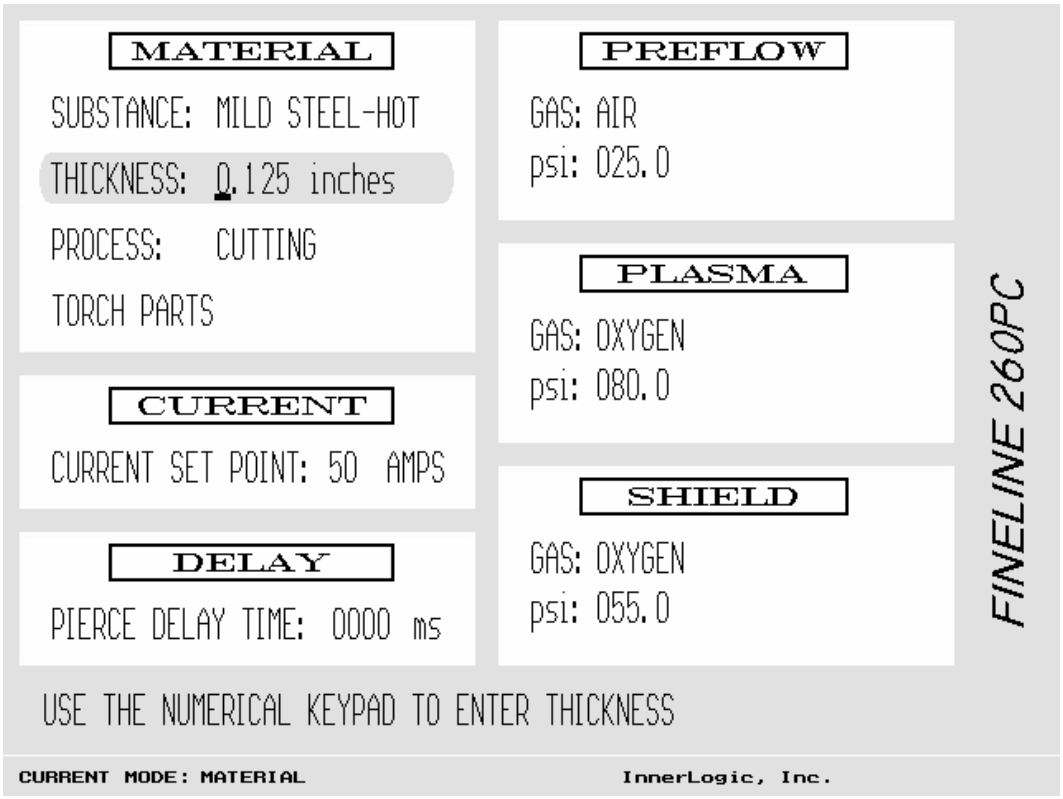


Figure 4-6 Setting Material Thickness

Selecting Process

To set the operating process, use the down arrow to scroll down to Process. The process area should be highlighted as shown in Figure 4-7 and the process should be blinking. To change the process, press F3 as indicated by the help prompt. Repeatedly pressing F3 will alternate between cutting and marking. Press the enter key when the desired process has been selected. At this point, the default cutting parameters are selected and adjusted automatically for the material type, material thickness, and process selected.

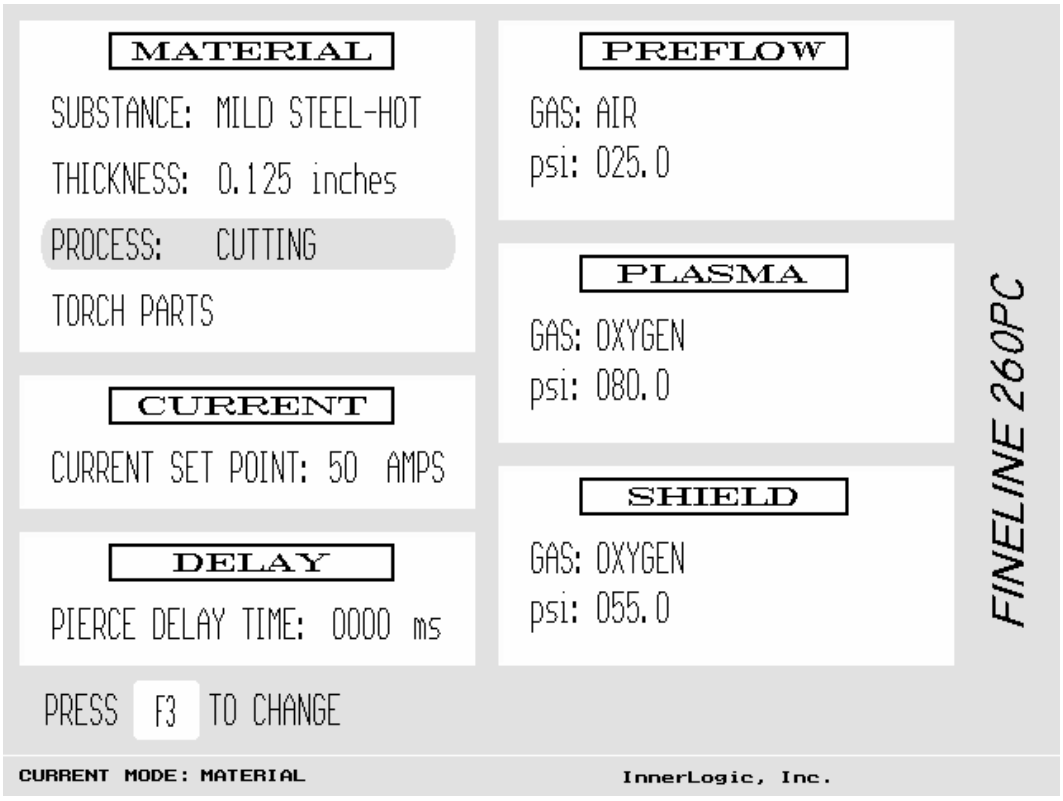


Figure 4-7 Selecting Process

Viewing the Torch Parts Required to Make the Cut

Once the material substance, thickness, and process have been chosen, the default cutting parameters are selected and adjusted accordingly. To display a pictorial view of the torch parts required to make the cut, scroll down to Torch Parts and press enter. The torch parts screen should be displayed as shown in Figure 4-8.

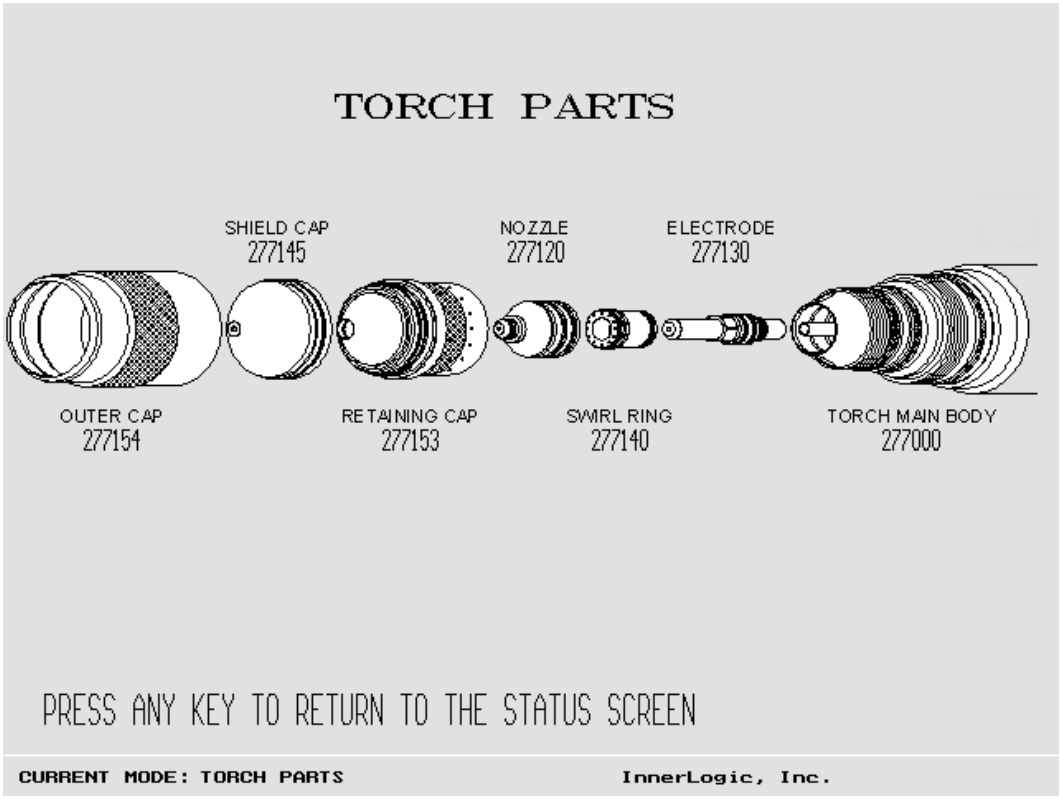


Figure 4-8 Torch Parts

Installing the Torch Parts

Note: When installing the torch parts, do not use an excessive amount of o-ring lubricant. Also, ensure that the lubricant is placed only on the o-rings. Excess lubricant can interfere with gas flow, cause starting problems, and shorten consumable life.

To install the torch parts, perform the following steps:

1. Insert the electrode into the swirl ring, then insert the electrode/swirl ring assembly into the nozzle.
2. Apply a small amount of o-ring lubricant to the electrode o-ring and the two o-rings on the nozzle.
3. Push the electrode/swirl ring/nozzle assembly into the torch until it is seated properly.
4. Inspect the threads on the torch body, copper retaining cap, and brass outer

cap and clean as necessary.

5. Install a small amount of o-ring lubricant to the three o-rings on the torch body.
6. Apply a small amount of o-ring lubricant to the retaining cap o-ring and install the retaining cap onto the torch body. Tighten the cap firmly but do not over tighten.
7. Apply a small amount of o-ring lubricant to the shield cap o-ring and install the shield cap into the brass outer cap. **Note: Make sure the shield cap o-ring is seated properly inside the outer cap**.
8. Install the outer cap onto the torch body and tighten firmly. Do not over tighten.

Viewing Recommended Height Control and X/Y Machine Settings

Prior to making a cut with the system, the torch height control and the x/y cutting machine must be configured properly. To view the recommended cutting data, press the Menu key, then Voltage. The voltage screen will be displayed as shown in Figure 4-9. The x/y machine speed should be set to the value shown. Also, the height control should be set to the proper pierce height, cutting height and arc voltage. If a KALIBURN Inova height control is being used, simply press the F3 key to automatically transmit the parameters to the Inova.

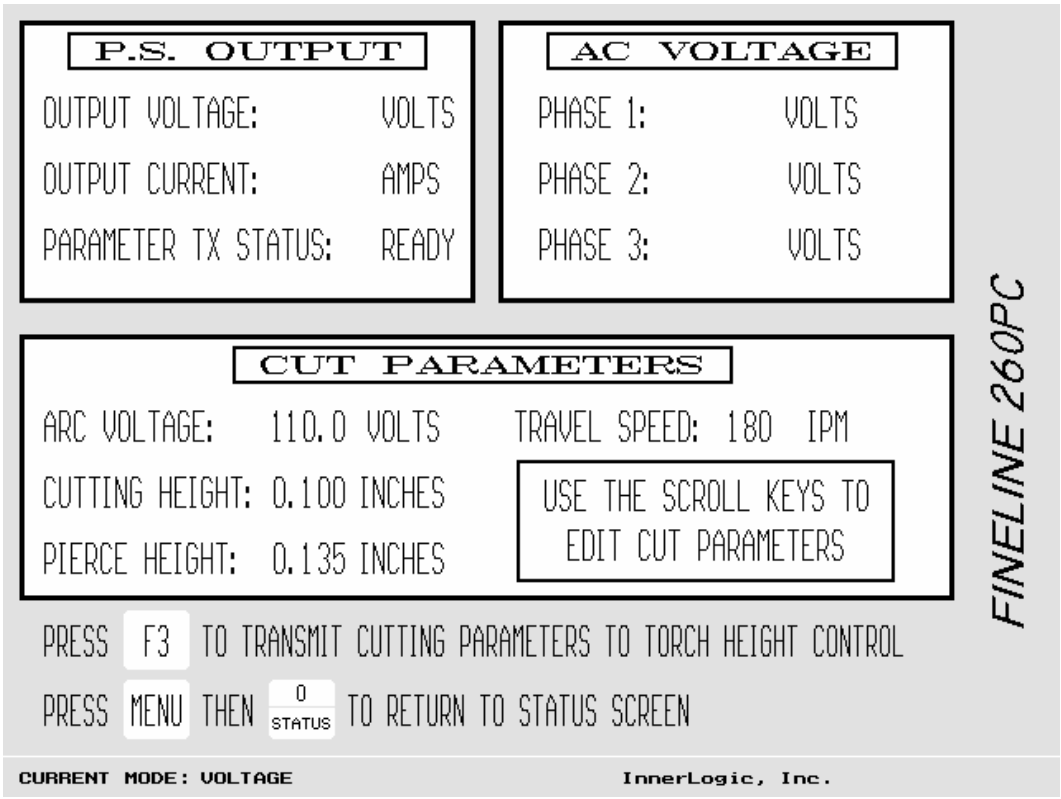

P.S. OUTPUT
OUTPUT VOLTAGE: VOLTS
OUTPUT CURRENT: AMPS
PARAMETER TX STATUS: READY
AC VOLTAGE
PHASE 1: VOLTS
PHASE 2: VOLTS
PHASE 3: VOLTS
CUT PARAMETERS
ARC VOLTAGE: 110.0 VOLTS
TRAVEL SPEED: 180 IPM
CUTTING HEIGHT: 0.100 INCHES
PIERCE HEIGHT: 0.135 INCHES
USE THE SCROLL KEYS TO EDIT CUT PARAMETERS
FINELINE 260PC
PRESS F3 TO TRANSMIT CUTTING PARAMETERS TO TORCH HEIGHT CONTROL
PRESS MENU THEN 0 STATUS TO RETURN TO STATUS SCREEN
CURRENT MODE: VOLTAGE
InnerLogic, Inc.

Figure 4-9 Voltage Screen

Making a Cut

Once the material type, thickness, and process have been entered, the correct torch parts are installed, and the x/y machine and height control systems have been properly configured, perform the following steps to cut with the system:

1. Depress and hold the Power On button until the Coolant Flow status LED illuminates. If the Coolant Flow led fails to illuminate after 10 seconds, see the maintenance section for possible solutions.
2. The automatic gas console will purge the gas hoses and set the correct gas pressures automatically. After the pressures have been set correctly, the Gas Console status LED will illuminate.
3. Once the Gas Console LED illuminates, the unit is ready for cutting. Upon the reception of a cycle start signal, the following sequence will take place:
   - Two second gas preflow
   - High frequency starting circuit energized
   - Pilot arc initiation
   - Transferred arc (cutting arc) established
   - Motion output relay energized after Pierce Delay timer complete
4. Upon removal of the cycle start signal, the following sequence will take place:
   - Cutting arc extinguished
   - Motion output relay deenergized
   - Gas postflow

Cut Quality

Before the optimum cutting condition can be achieved on a particular material type and thickness, the machine operator must have a thorough understanding of the cutting characteristics of the FineLine system. When the cut quality is not satisfactory, the cutting speed, torch height, or gas pressures may need to be adjusted in small increments until the proper cutting condition is obtained. The following guidelines should be useful in determining which cutting parameter to adjust.

Note: Before making any parameter changes, verify that the torch is square to the workpiece. Also, it is essential to have the correct torch parts in place and to ensure that they are in good condition. Check the electrode for excessive wear and the nozzle and shield cap orifices for roundness. Also, check the parts for any dents or distortions. Irregularities in the torch parts can cause cut quality problems.

1. A positive cut angle (top dimension of piece smaller than the bottom dimension) usually occurs when the torch standoff distance is too high, when cutting too fast, or when excessive power is used to cut a given plate thickness.
2. A negative cut angle (top dimension of piece larger than the bottom dimension) usually occurs when the torch standoff distance is too low or when

the cutting speed is too slow.

3. Top dross usually occurs when the torch standoff distance is too high.
4. Bottom dross usually occurs when the cutting speed is either too slow (slow-speed dross) or too fast (high-speed dross). Low-speed dross is easily removed, while high-speed dross usually requires grinding or chipping off. When using oxygen as the shielding gas, bottom dross can sometimes be removed by increasing the shield gas pressure. However, increasing the shield pressure too much can cause cut face irregularities (see below). Bottom dross also occurs more frequently as the metal heats up. As more pieces are cut out of a particular plate, the more likely they are to form dross.
5. When using oxygen as a shielding gas, cut face irregularities usually indicate that the shield gas pressure is too high or the torch standoff distance is too low.
6. A concave cut face usually indicates that the torch standoff distance is too low or the shield gas pressure is too high. A convex cut face usually indicates that the torch standoff distance is too high or the shield gas pressure is too low.
7. Note that different material compositions have an effect on dross formation.

Consumable Life

Use the following guidelines to maximize consumable parts life:

1. Use the recommended pierce height given in the cutting charts. A pierce height that is too low will allow molten metal that is ejected during the piercing process to damage the shield cap and nozzle. A pierce height that is too high will cause the pilot arc time to be excessively long and will cause nozzle damage.
2. Make sure the arc extinguishes properly at the end of each cut. Program the lead-out such that the arc is not lost before the lead-out is complete. The arc must remain transferred to the workpiece throughout the turn-off sequence. A "popping" noise can be heard if the arc extinguishes abnormally.
3. Make sure the torch does not touch the plate while cutting. Shield cap and nozzle damage will result.
4. Use a chain cut when possible. Starting and stopping the torch is much more detrimental to the consumables than making a continuous cut.
5. Always use the error-tracking feature on the automatic gas console to keep track of cut errors. See Section 5 for information on the error-tracking feature.

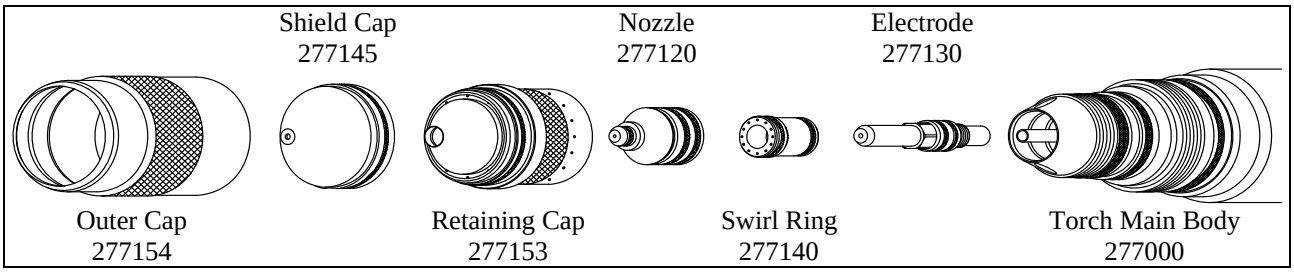
Cutting Charts

The cutting charts shown on the following pages are intended to give the operator the best starting point to use when making a cut on a particular material type and thickness. Small adjustments may have to be made to achieve the best cut. Also, remember that the arc voltage must be increased as the electrode wears in order to maintain the correct cutting height.

Cutting Chart Index

Material	Process	Current	Plasma Gas	Shield Gas	Page
Mild Steel	Cutting	30 Amps	Oxygen	Oxygen	4-14
Mild Steel	Cutting	50 Amps	Oxygen	Oxygen or Air	4-15
Mild Steel	Cutting	70 Amps	Oxygen	Air	4-16
Mild Steel	Cutting	100 Amps	Oxygen	Air	4-17
Mild Steel	Cutting	150 Amps	Oxygen	Air	4-18
Mild Steel	Cutting	200 Amps	Oxygen	Air	4-19
Mild Steel	Cutting	275 Amps	Oxygen	Air	4-20
Stainless Steel	Cutting	30 Amps	Air	Air	4-21
Stainless Steel	Cutting	50 Amps	Air	Nitrogen	4-22
Stainless Steel	Cutting	70 Amps	H17	Nitrogen	4-23
Stainless Steel	Cutting	70 Amps	Air	Nitrogen	4-24
Stainless Steel	Cutting	100 Amps	H17	Nitrogen	4-25
Stainless Steel	Cutting	100 Amps	Air	Nitrogen	4-26
Stainless Steel	Cutting	150 Amps	H17	Nitrogen	4-27
Stainless Steel	Cutting	150 Amps	Air	Nitrogen	4-28
Stainless Steel	Cutting	200 Amps	H17	Nitrogen	4-29
Stainless Steel	Cutting	200 Amps	Air	Nitrogen	4-30
Stainless Steel	Cutting	260 Amps	H17	Nitrogen	4-31
Stainless Steel	Cutting	275 Amps	Air	Nitrogen	4-32
Aluminum	Cutting	30 Amps	Air	Nitrogen	4-33
Aluminum	Cutting	50 Amps	Air	Nitrogen	4-34
Aluminum	Cutting	70 Amps	Air	Nitrogen	4-35
Aluminum	Cutting	100 Amps	Air	Nitrogen	4-36
Aluminum	Cutting	150 Amps	Air	Nitrogen	4-37
Aluminum	Cutting	200 Amps	Air	Nitrogen	4-38
Aluminum	Cutting	275 Amps	Air	Nitrogen	4-39
Mild Steel	Marking	10 Amps	Nitrogen	Nitrogen	4-40
Stainless Steel	Marking	8 Amps	Nitrogen	Nitrogen	4-41
Aluminum	Marking	10 Amps	Nitrogen	Nitrogen	4-42

Mild Steel - Cutting
30 Amps – Oxygen Plasma / Oxygen Shield



Imperial

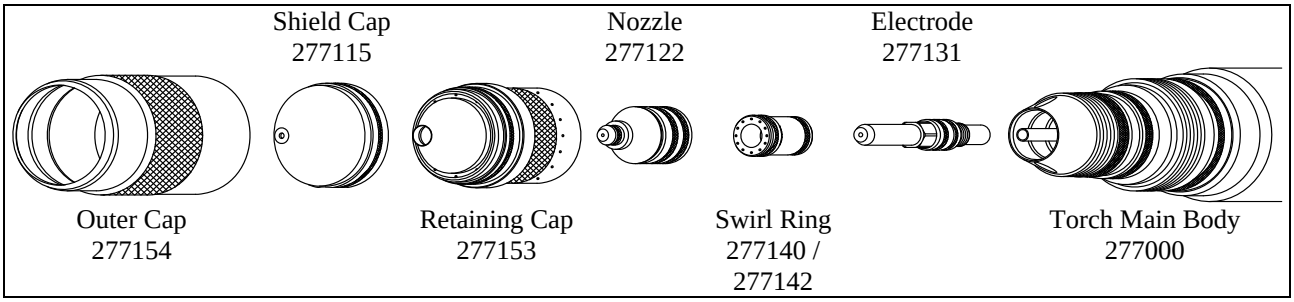
Material Thickness (ga)	Material Thickness (in)	Preflow (Air) (psi)	Plasma (Oxygen) (psi)	Shield (Oxygen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
20	.036	35	85	6	2	120	105	.080	.110	100	.062
18	.048					121	97	.090			
16	.060					125	78	.105			.065
14	.075					126	65				
12	.105					127	55				.070
11	.120					129	50	.120	.125		
10	.135					131	40				

Metric

Material Thickness (mm)	Preflow (Air) (psi)	Plasma (Oxygen) (psi)	Shield (Oxygen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
1	35	85	6	2	120	2615	2.0	2.8	100	1.6
1.5					124	2020	2.6			1.7
2					126	1615	2.7			
2.5						1455				1.8
3					128	1285	2.9	3.1		

1. Revised on 7/2/07

Mild Steel - Cutting
50 Amps – Oxygen Plasma / Oxygen or Air Shield



Imperial

Cold-Rolled Steel – Oxygen Shield – Swirl Ring 277140

Material Thickness (ga)	Material Thickness (in)	Preflow (Air) (psi)	Plasma (Oxygen) (psi)	Shield (Oxygen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
12	.105	25	74	12	1	123	70	.120	.135	100	.075
11	.120					126	60	.125			.078
10	.135					128	50	.135			

Hot-Rolled Steel – Air Shield – Swirl Ring 277142

Material Thickness (ga)	Material Thickness (in)	Preflow (Air) (psi)	Plasma (Oxygen) (psi)	Shield (Air) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
14	.075	25	74	19	1	106	200	.100	.135	100	.075
12	.105						190				
	.125						180				.080
10	.135					110	170	.110			
	3/16					113	105	.140	.145	200	.085
	1/4					117	75		.165	250	.087

Metric

Cold-Rolled Steel – Oxygen Shield – Swirl Ring 277140

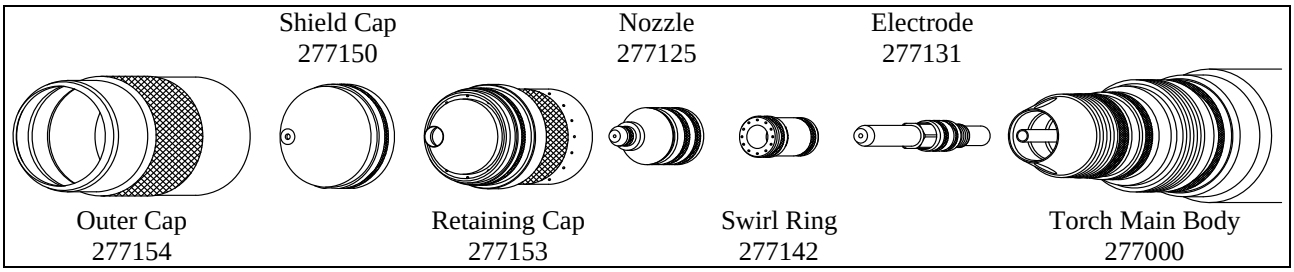
Material Thickness (mm)	Preflow (Air) (psi)	Plasma (Oxygen) (psi)	Shield (Oxygen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
2.5	25	74	12	1	121	1895	2.9	3.4	100	1.9
3					125	1555	3.1			2.0

Hot-Rolled Steel – Air Shield – Swirl Ring 277142

Material Thickness (mm)	Preflow (Air) (psi)	Plasma (Oxygen) (psi)	Shield (Air) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
2.5	25	74	19	1	106	4885	2.5	3.4	100	1.9
3						4660				2.0
5					113	2555	3.6	3.7	250	2.2
6					116	2075		4.0		

1. Revised on 7/2/07

Mild Steel - Cutting
70 Amps – Oxygen Plasma / Air Shield



Imperial

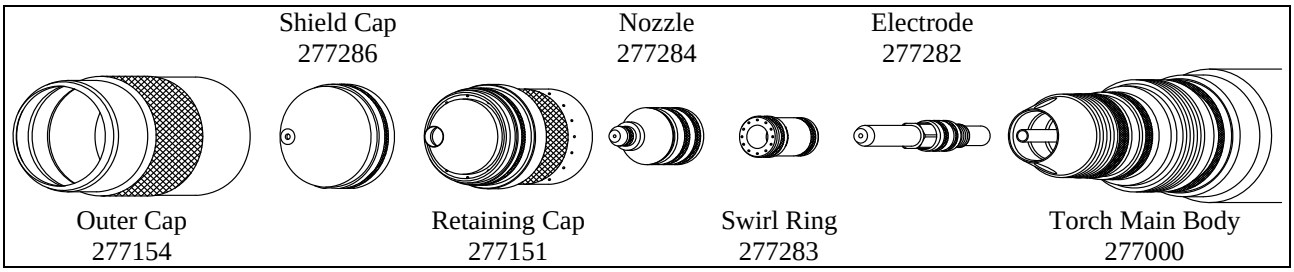
Material Thickness (in)	Preflow (Air) (psi)	Plasma (Oxygen) (psi)	Shield (Air) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
1/8	25	80	35	2	110	190	.100	.100	100	.080
3/16			25		113	130				
1/4					116	120	.110	.125	200	.085
3/8					122	75	.140	.150	250	

Metric

Material Thickness (mm)	Preflow (Air) (psi)	Plasma (Oxygen) (psi)	Shield (Air) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
3	25	80	35	2	109	4995	2.5	2.5	100	2.0
5			25		113	3265		2.6	200	
6					115	3105	2.7	3.0		2.2

1. Revised on 7/2/07

Mild Steel - Cutting
100 Amps – Oxygen Plasma / Air Shield



Imperial

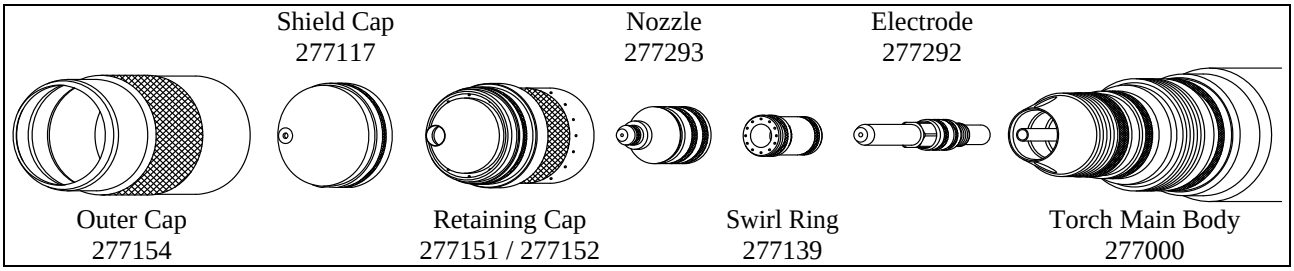
Material Thickness (in)	Preflow (Air) (psi)	Plasma (Oxygen) (psi)	Shield (Air) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
1/4	25	94	26	0	125	150	.090	.125	150	.090
3/8					130	100	.130	.175	200	
1/2						65	.155	.200	400	
5/8					143	47	.185		600	.095
3/4					145	35			900	

Metric

Material Thickness (mm)	Preflow (Air) (psi)	Plasma (Oxygen) (psi)	Shield (Air) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
6	25	94	26	0	124	3950	2.1	3.0	150	2.3
10					130	2405	3.3	4.5	400	
12						1850	3.7	4.9		
16					143	1180	4.7	5.1	900	2.4
20					145	800				

1. Revised on 7/2/07

Mild Steel - Cutting
150 Amps – Oxygen Plasma / Air Shield



Imperial

Retaining Cap 277151

Material Thickness (in)	Preflow (Air) (psi)	Plasma (Oxygen) (psi)	Shield (Air) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
1/4	20	74	30	0	118	165	.105	.200	300	.125
3/8					123	125	.135	.225	400	
1/2					125	90	.140	.250		.130

Retaining Cap 277152

Material Thickness (in)	Preflow (Air) (psi)	Plasma (Oxygen) (psi)	Shield (Air) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
5/8	20	74	45	0	127	70	.140	.275	600	.130
3/4					130	55		.300	900	.135
1					134	40	.150		1200	.140
1.25 **					145	25	.200		500	
1.5 **					155	15	.225			

** Edge start or moving pierce recommended

Metric

Retaining Cap 277151

Material Thickness (mm)	Preflow (Air) (psi)	Plasma (Oxygen) (psi)	Shield (Air) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
6	20	74	30	0	117	4305	2.6	5.0	300	3.2
10					123	3040	3.4	5.8	400	
12					124	2485	3.5	6.2		3.3

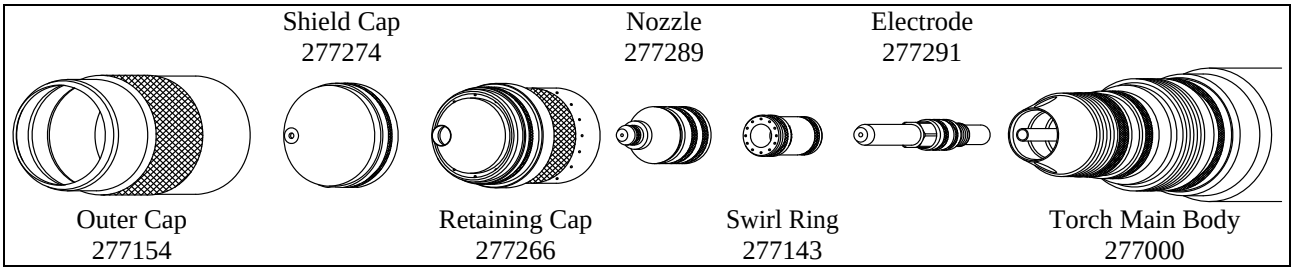
Retaining Cap 277152

Material Thickness (mm)	Preflow (Air) (psi)	Plasma (Oxygen) (psi)	Shield (Air) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
16	20	74	45	0	127	1760	3.6	7.0	900	3.3
20					130	1340		7.6	1200	3.4
25					133	1040	3.7			3.6
32 **					145	625	5.1		500	
38 **					154	385	5.6			

** Edge start or moving pierce recommended

1. Revised on 7/2/07

Mild Steel - Cutting
200 Amps – Oxygen Plasma / Air Shield



Imperial

Material Thickness (in)	Preflow (Air) (psi)	Plasma (Oxygen) (psi)	Shield (Air) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
1/4	20	82	58	0	125	230	.040	.200	300	.150
3/8					130	140	.090	.225		
1/2					133	120	.115	.250	500	
5/8					137	100	.130			.152
3/4					140	75	.150	.300	700	.153
1					147	50	.175		1000	.155
1.25					155	25	.240	.350	1400	
1.5 **					165	17	.300	.300	400	158
1.75 **					175	12	.350			
2.0 **					185	7	.500			.160

** Edge start or moving pierce recommended

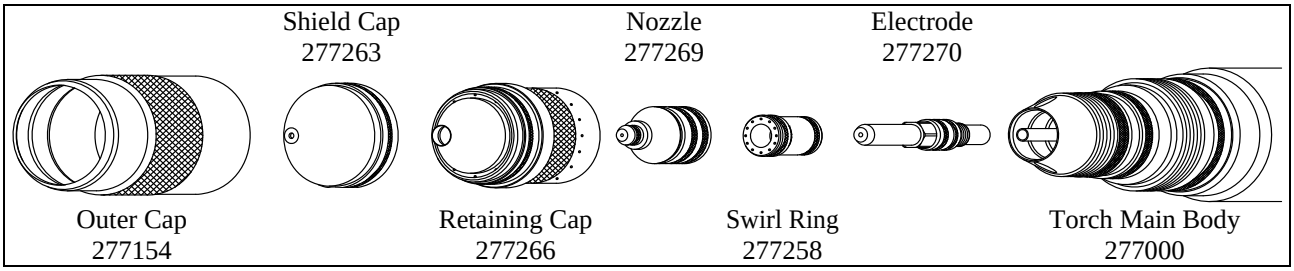
Metric

Material Thickness (mm)	Preflow (Air) (psi)	Plasma (Oxygen) (psi)	Shield (Air) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
6	20	82	58	0	124	6100	.8	5.0	300	3.8
10					130	3480	2.3	5.8	500	
12					132	3160	2.7	6.2		
16					137	2515	3.3	6.4	700	3.9
20					141	1810	3.8	7.6	1000	
25					146	1310	4.3			
32					155	610	6.1	8.9	1400	
38 **					164	435	7.5	7.6	400	4.0
45 **					175	295	9.2			
50 **					183	195	12.2			4.1

** Edge start or moving pierce recommended

1. Revised on 7/2/07

Mild Steel - Cutting
275 Amps – Oxygen Plasma / Air Shield



Imperial

Material Thickness (in)	Preflow (Air) (psi)	Plasma (Oxygen) (psi)	Shield (Air) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
1/2	20	93	70	0	139	125	.140	.275	300	.165
5/8						105	.135		500	
3/4					138	90	.120	.300	700	.170
1					144	65	.160		900	.185
1.25					150	45	.175	.350	1200	
1.5 **					163	25	.235		400	.190
1.75 **					170	20	.290			
2.0 **					180	15	.350			

** Edge start or moving pierce recommended

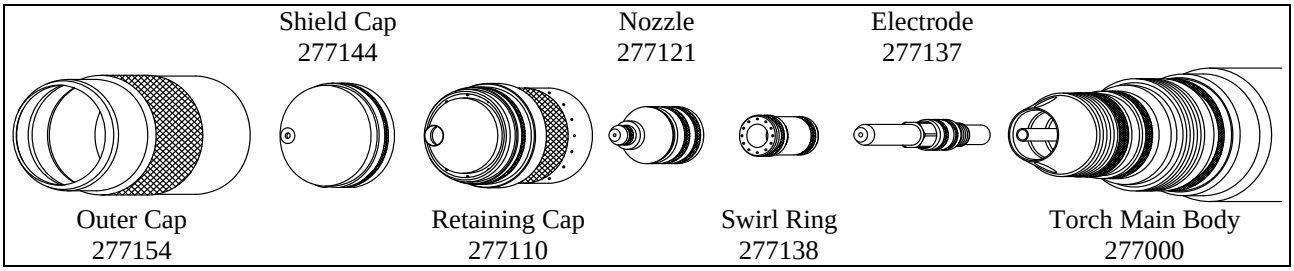
Metric

Material Thickness (mm)	Preflow (Air) (psi)	Plasma (Oxygen) (psi)	Shield (Air) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
12	20	93	70	0	139	3290	3.6	7.0	300	4.2
16					138	2650	3.3		700	
20						2190	3.1	7.6	900	4.3
25					143	1690	4.0			4.7
32					150	1120	4.4	8.9	1200	
38 **					162	645	5.9		400	4.8
45 **					170	495	7.5			
50 **					178	395	8.7			

** Edge start or moving pierce recommended

1. Revised on 7/2/07

Stainless Steel - Cutting
30 Amps – Air Plasma / Air Shield



Imperial

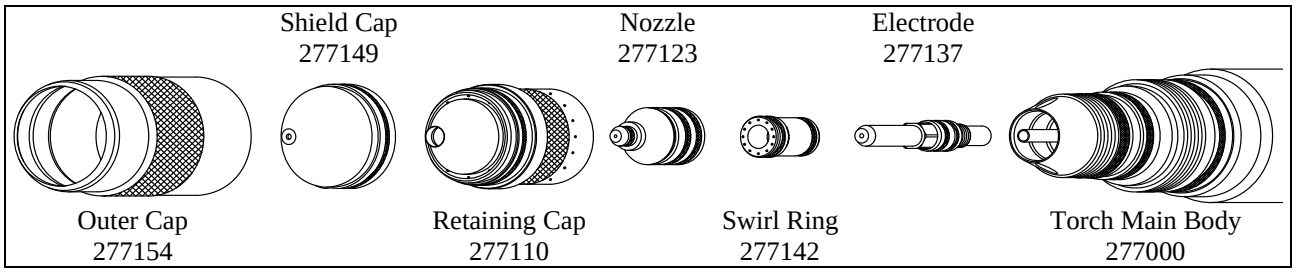
Material Thickness (ga)	Material Thickness (in)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Air) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
20	.036	30	80	30	14	71	200	.020	.050	100	.065
18	.048						165	.035			
16	.060					74	125				.068
14	.075					75	90	.025			.070

Metric

Material Thickness (mm)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Air) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
1	30	80	30	14	71	4855	0.6	1.3	100	1.7
1.5					73	3260	0.9			

1. Revised on 7/2/07

Stainless Steel - Cutting
50 Amps – Air Plasma / Nitrogen Shield



Imperial

Material Thickness (ga)	Material Thickness (in)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
14	.075	30	70	40	4	87	105	.035	.060	100	.105
12	.105					88	75				
11	.120					89	65				
10	.135					90	55				.110
	3/16					94	50	.040	.075	200	
	1/4					100	40	.060	.085	300	.115

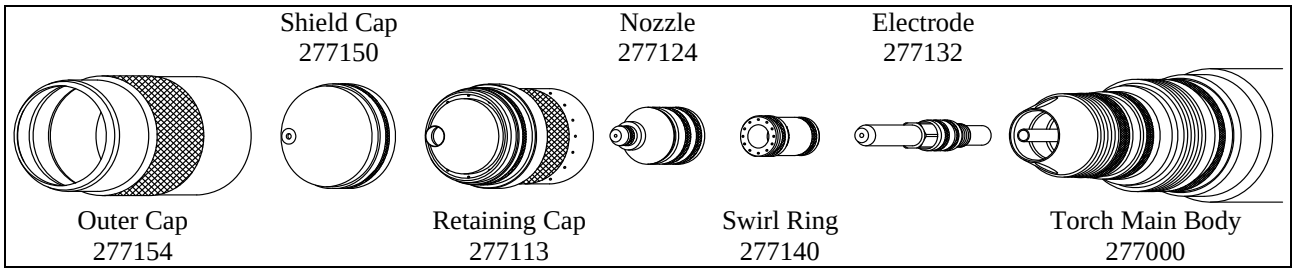
Metric

Material Thickness (mm)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
2	30	70	40	4	87	2565	.9	1.5	100	2.7
2.5						2080				
3					88	1685				
5					94	1235	1.0	1.9	300	2.8
6					98	1075	1.3	2.1		2.9

1. Revised on 7/2/07

Stainless Steel - Cutting
70 Amps – H17 Plasma / Nitrogen Shield

This gas combination gives the best cut quality and minimum dross levels



Imperial

Material Thickness (in)	Preflow (Nitrogen) (psi)	Plasma (H17) (psi)	Shield (Nitrogen) (psi)	Postflow (Nitrogen) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
3/16	35	60	36	13	135	80	.100	.200	200	.090

Metric

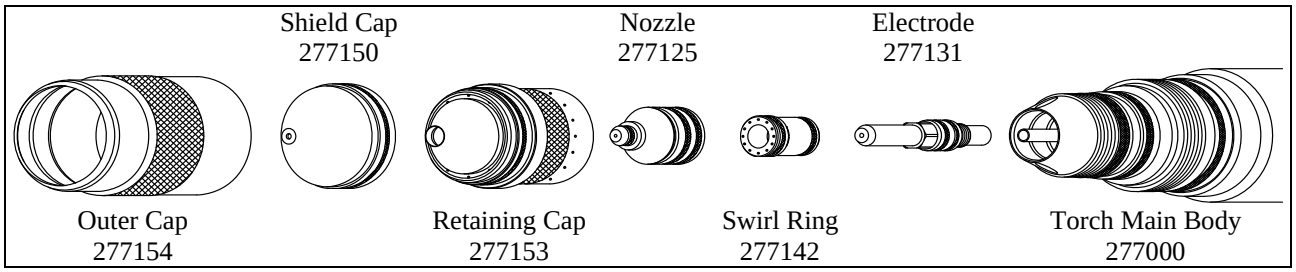
Material Thickness (mm)	Preflow (Nitrogen) (psi)	Plasma (H17) (psi)	Shield (Nitrogen) (psi)	Postflow (Nitrogen) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
5	35	60	36	13	135	2030	2.5	5.1	200	2.3

* H17 = 17.5% Hydrogen / 32.5% Argon / 50% Nitrogen

1. Revised on 7/2/07

Stainless Steel - Cutting
70 Amps – Air Plasma / Nitrogen Shield

This gas combination gives medium cut quality and minimum dross levels



Imperial

Material Thickness (ga)	Material Thickness (in)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
10	.135	25	80	25	2	132	120	.060	.150	200	.085
	3/16					134	100	.070	.175		
	1/4					140	75	.090	.200	300	.090
	3/8					148	50	.120	.225	450	

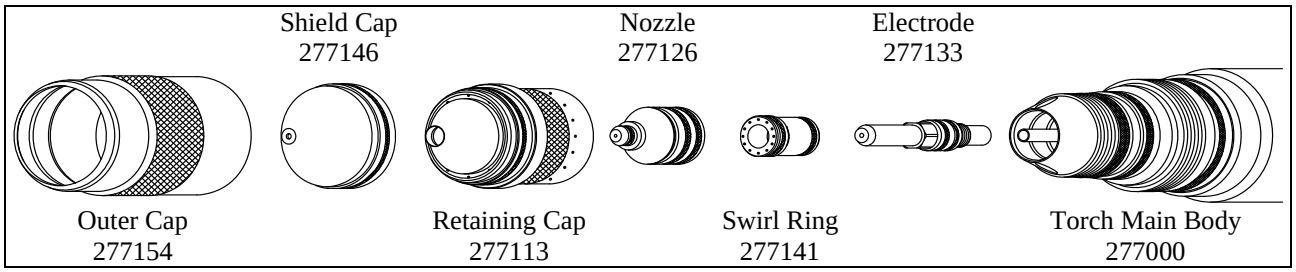
Metric

Material Thickness (mm)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
3	25	80	25	2	131	3210	1.4	3.6	200	2.2
5					134	2445	1.8	4.5	300	
6					138	2050	2.1	4.9		2.3

1. Revised on 7/2/07

Stainless Steel - Cutting
100 Amps – H17 Plasma / Nitrogen Shield

This gas combination gives the best cut quality and minimum dross levels



Imperial

Material Thickness (in)	Preflow (Nitrogen) (psi)	Plasma (H17) (psi)	Shield (Nitrogen) (psi)	Postflow (Nitrogen) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
3/16	28	67	46	13	138	115	.105	.200	200	.100
1/4					140	100	.125	.225	300	.105
3/8					152	65	.180	.250	400	

Metric

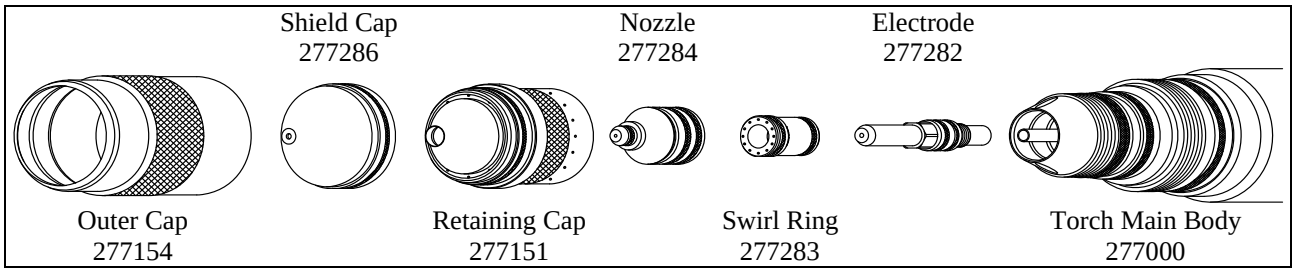
Material Thickness (mm)	Preflow (Nitrogen) (psi)	Plasma (H17) (psi)	Shield (Nitrogen) (psi)	Postflow (Nitrogen) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
5	28	67	46	13	138	2865	2.7	5.1	300	2.5
6					139	2625	3.0	5.5		2.7

* H17 = 17.5% Hydrogen / 32.5% Argon / 50% Nitrogen

1. Revised on 7/2/07

Stainless Steel - Cutting
100 Amps – Air Plasma / Nitrogen Shield

This gas combination gives medium cut quality and minimum dross levels



Imperial

Material Thickness (in)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
1/4	25	94	35	0	141	100	.135	.200	250	.092
3/8					147	80	.170	.225	350	.095
1/2					154	55	.210	.250	450	

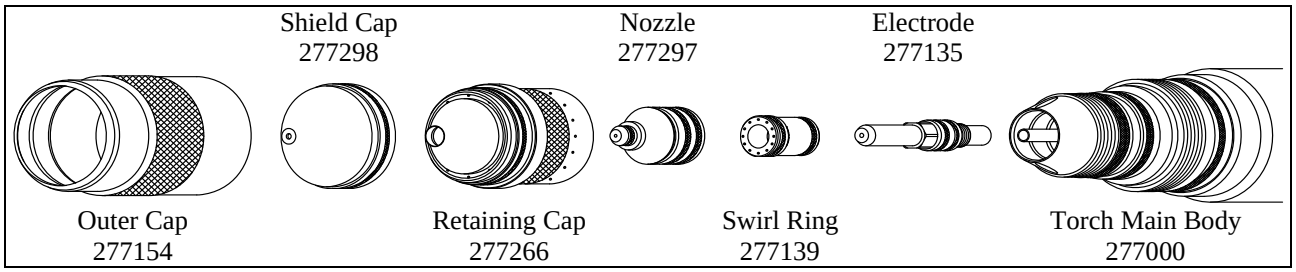
Metric

Material Thickness (mm)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
6	25	94	35	0	140	2595	3.2	5.0	250	2.3
10					148	1935	4.4	5.8	450	2.4
12					152	1540	5.0	6.2		

1. Revised on 7/2/07

Stainless Steel - Cutting
150 Amps – H17 Plasma / Nitrogen Shield

This gas combination gives the best cut quality and minimum dross levels



Imperial

Material Thickness (in)	Preflow (Nitrogen) (psi)	Plasma (H17) (psi)	Shield (Nitrogen) (psi)	Postflow (Nitrogen) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
1/4	25	81	75	13	165	95	.250	.250	400	.135
3/8					155	75	.150	.275	500	
1/2						60	.165		600	.140
5/8						50	.185	.300	800	
3/4					165	40	.250		1000	.145

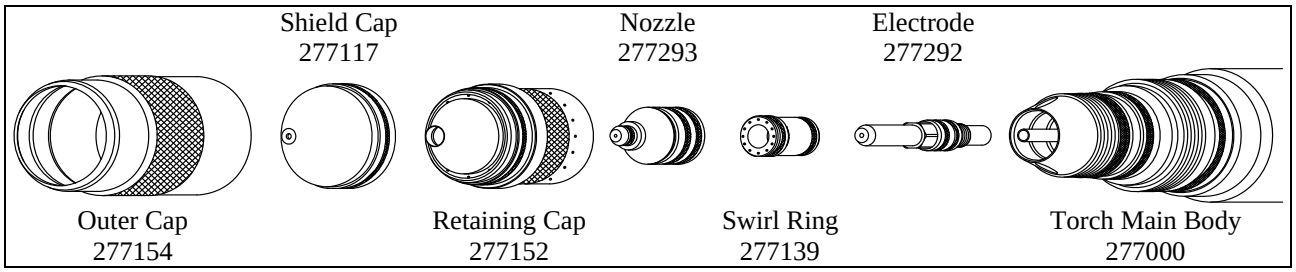
Metric

Material Thickness (mm)	Preflow (Nitrogen) (psi)	Plasma (H17) (psi)	Shield (Nitrogen) (psi)	Postflow (Nitrogen) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
10	25	81	75	13	155	1845	3.8	7.0	600	3.4
12						1610	4.1			3.6
16						1260	4.7	7.6	1000	
20					167	940	6.9			3.7

* H17 = 17.5% Hydrogen / 32.5% Argon / 50% Nitrogen
1. Revised on 7/2/07

Stainless Steel - Cutting
150 Amps – Air Plasma / Nitrogen Shield

This gas combination gives medium cut quality and minimum dross levels



Imperial

Material Thickness (in)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
1/4	25	75	70	0	145	150	.160	.225	400	.125
3/8					150	115	.180	.275	500	
1/2					155	85	.210		600	.130
5/8					160	60	.220	.300	800	
3/4					168	45	.240		1000	.135

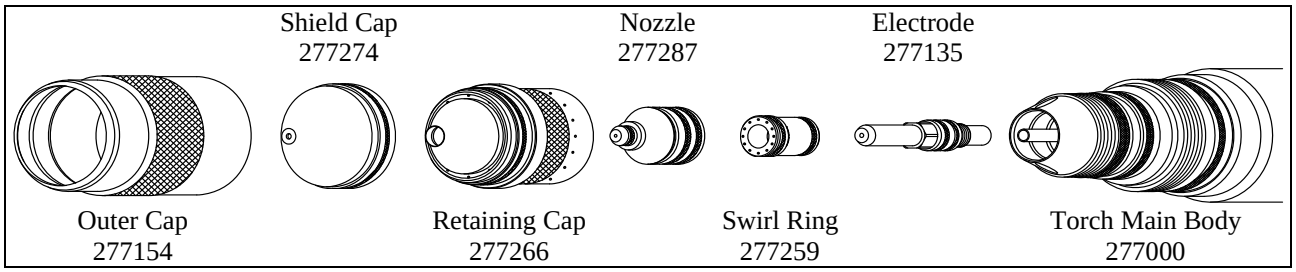
Metric

Material Thickness (mm)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
6	25	75	70	0	144	3910	4.0	5.5	400	3.2
10					150	2805	4.7	7.0	600	
12					153	2330	5.1			3.3
16					160	1510	5.6	7.6	1000	
20					170	1030	6.2			3.4

1. Revised on 7/2/07

Stainless Steel - Cutting
200 Amps – H17 Plasma / Nitrogen Shield

This gas combination gives the good cut quality and minimum dross levels



Imperial

Material Thickness (in)	Preflow (Nitrogen) (psi)	Plasma (H17) (psi)	Shield (Nitrogen) (psi)	Postflow (Nitrogen) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
3/8	37	68	85	13	156	80	.195	.250	300	.150
1/2					148	75	.130	.275	500	
5/8					155	60	.190		700	.155
3/4					160	50	.200	.300	900	
1.0					170	35	.240	.325	1300	.160

Metric

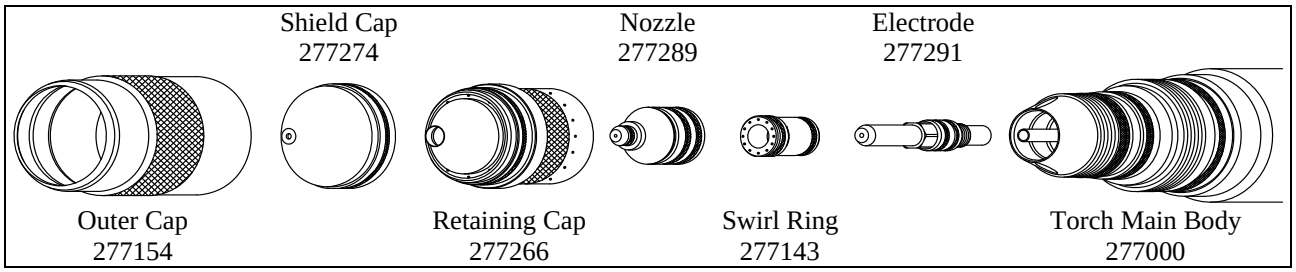
Material Thickness (mm)	Preflow (Nitrogen) (psi)	Plasma (H17) (psi)	Shield (Nitrogen) (psi)	Postflow (Nitrogen) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
10	37	68	85	13	154	2010	4.7	6.4	500	3.8
12					149	1935	3.6	6.8		
16					155	1515	4.8	7.0	900	3.9
20					161	1215	5.2	7.7	1300	
25					169	915	6.0	8.2		4.1

* H17 = 17.5% Hydrogen / 32.5% Argon / 50% Nitrogen

1. Revised on 7/2/07

Stainless Steel - Cutting
200 Amps – Air Plasma / Nitrogen Shield

This gas combination gives medium cut quality and minimum dross levels



Imperial

Material Thickness (in)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
1/4	20	82	58	0	130	200	.070	.200	200	.150
3/8					133	150		.225	300	
1/2					140	110	.115	.250		.152
5/8					146	75	.150	.300	600	.155
3/4					153	60	.190		800	
1.0					158	40	.210	.325	1200	.160
1.25 **					170	20	.250		300	.165
1.5 **					180	10	.275			.175

** Edge start or moving pierce recommended

Metric

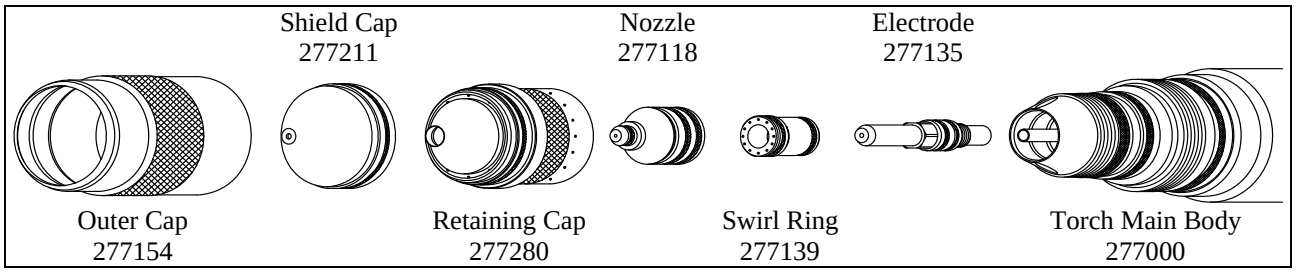
Material Thickness (mm)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
6	20	82	58	0	129	5220	1.8	5.0	200	3.8
10					134	3655	1.9	5.8	300	
12					138	3020	2.6	6.2		3.9
16					146	1890	3.8	7.6	800	
20					153	1450	4.8	7.7	1200	
25					157	1050	5.2	8.2		4.1
32 **					170	495	6.4	8.3	300	4.2
38 **					179	260	6.9			4.4

** Edge start or moving pierce recommended

1. Revised on 7/2/07

Stainless Steel - Cutting
260 Amps – H17 Plasma / Nitrogen Shield

This gas combination gives the best cut quality and minimum dross levels



Imperial

Material Thickness (in)	Preflow (Nitrogen) (psi)	Plasma (H17) (psi)	Shield (Nitrogen) (psi)	Postflow (Nitrogen) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
3/8	40	63	70	14	145	85	.160	.275	500	.190
1/2					142	80	.140			
5/8					145	65	.185		600	.195
3/4					150	55	.225	.300	800	
1.0					160	33	.250	.325	1000	.200
1.25 **					170	26	.280	.300	500	.205

** Edge start or moving pierce recommended

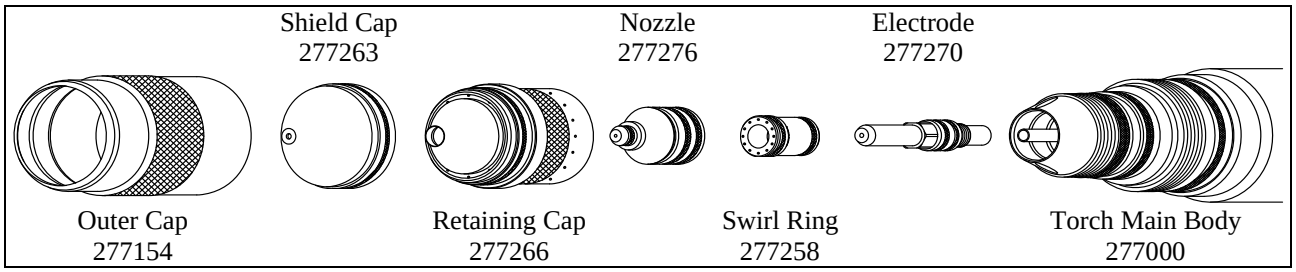
Metric

Material Thickness (mm)	Preflow (Nitrogen) (psi)	Plasma (H17) (psi)	Shield (Nitrogen) (psi)	Postflow (Nitrogen) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
10	40	63	70	14	144	2140	4.0	7.0	500	4.8
12					142	2060	3.7			
16					145	1640	4.7		800	5.0
20					151	1315	5.8	7.7	1000	
25					159	875	6.3	8.2		5.1
32 **					170	650	7.1	7.5	500	5.2

* H17 = 17.5% Hydrogen / 32.5% Argon / 50% Nitrogen
** Edge start required – some dross evident
1. Revised on 7/2/07

Stainless Steel - Cutting
275 Amps – Air Plasma / Nitrogen Shield

This gas combination gives medium cut quality and minimum dross levels



Imperial

Material Thickness (in)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
1/2	20	93	70	0	143	120	.125	.250	400	.165
5/8					148	90	.140	.275	600	
3/4					152	80	.180	.300	800	.170
1.0					165	55	.210	.325	1000	
1.25 **					175	35	.250		400	.180
1.5 **					185	25	.300			

** Edge start or moving pierce recommended

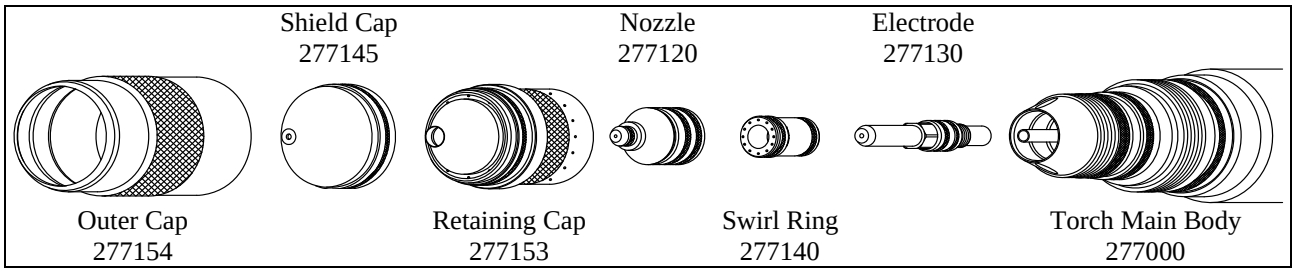
Metric

Material Thickness (mm)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
12	20	93	70	0	141	3220	3.1	6.2	400	4.2
16					148	2275	3.6	7.0	800	
20					153	1940	4.7	7.7	1000	4.3
25					164	1435	5.2	8.2		
32 **					175	880	6.4	8.3	400	4.6
38 **					184	640	7.5			

** Edge start or moving pierce recommended

1. Revised on 7/2/07

Aluminum - Cutting
30 Amps – Air Plasma / Nitrogen Shield



Imperial

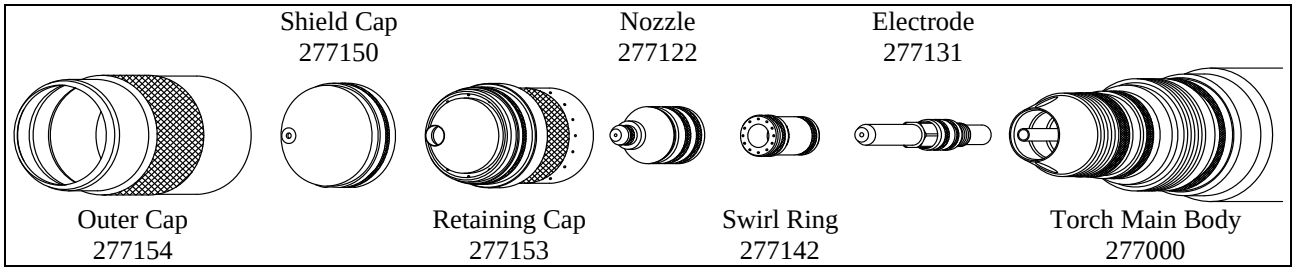
Material Thickness (in)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
.040	30	92	20	2	135	150	.030	.065	100	.065
.050						120		.075		
.063						90		.085		.070

Metric

Material Thickness (mm)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
1	30	92	20	2	135	3885	0.8	1.6	100	1.7
1.5					135	2520		2.1		1.8

1. Revised on 7/2/07

Aluminum - Cutting
50 Amps – Air Plasma / Nitrogen Shield



Imperial

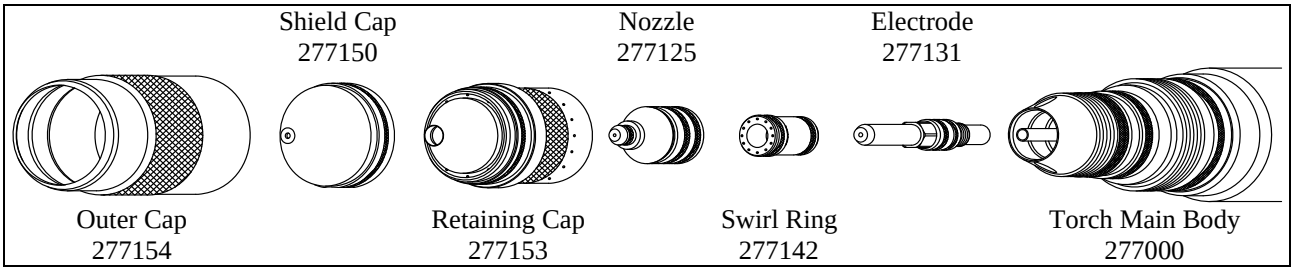
Material Thickness (in)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
.050	25	74	19	1	135	180	.050	.100	100	.080
.063					138	140	.065			.082
.080					143	90	.075			.085

Metric

Material Thickness (mm)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
1.5	25	74	19	1	137	3870	1.5	2.5	100	2.1
2.0					142	2360	1.8			2.2

1. Revised on 7/2/07

Aluminum - Cutting
70 Amps – Air Plasma / Nitrogen Shield



Imperial

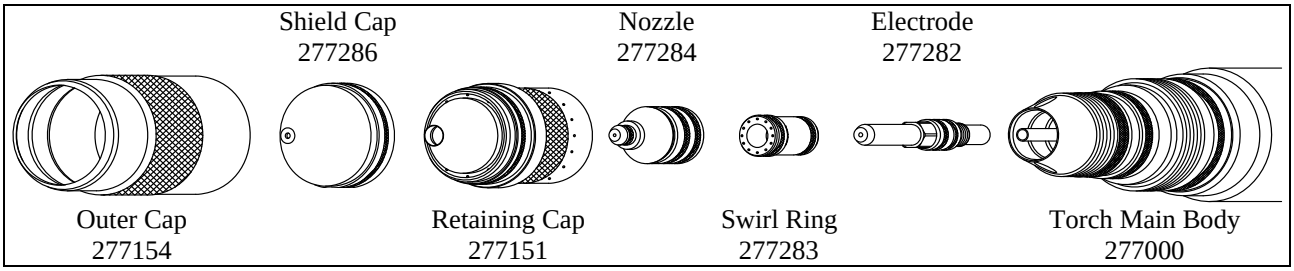
Material Thickness (in)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
.080	25	80	25	2	130	250	.050	.100	100	.080
1/8					135	160	.070			
3/16					145	80	.100	.125		.085
1/4					150	50	.060	.150	200	
3/8					155	40	.075	.175	300	.090
1/2					162	30	.115	.200	400	

Metric

Material Thickness (mm)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
2	25	80	25	2	129	6400	1.2	2.5	100	2.0
3					134	4420	1.7			
5					145	1920	2.3	3.2	200	2.2
6					148	1440	1.7	3.6		
10					156	975	2.0	4.5	400	2.3
12					160	820	2.6	4.9		

1. Revised on 7/2/07

Aluminum - Cutting
100 Amps – Air Plasma / Nitrogen Shield



Imperial

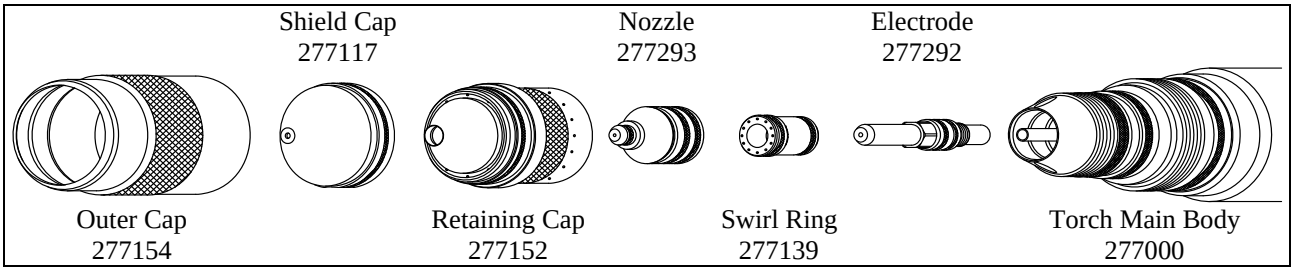
Material Thickness (in)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
1/4	25	94	26	0	145	105	.155	.200	200	.095
3/8					156	90	.180	.250	300	.098
1/2					157	70	.195	.275	400	.100

Metric

Material Thickness (mm)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
6	25	94	26	0	143	2710	3.8	4.9	200	2.4
10					156	2210	4.6	6.4	400	2.5
12					156	1890	4.9	6.8		

1. Revised on 7/2/07

Aluminum - Cutting
150 Amps – Air Plasma / Nitrogen Shield



Imperial

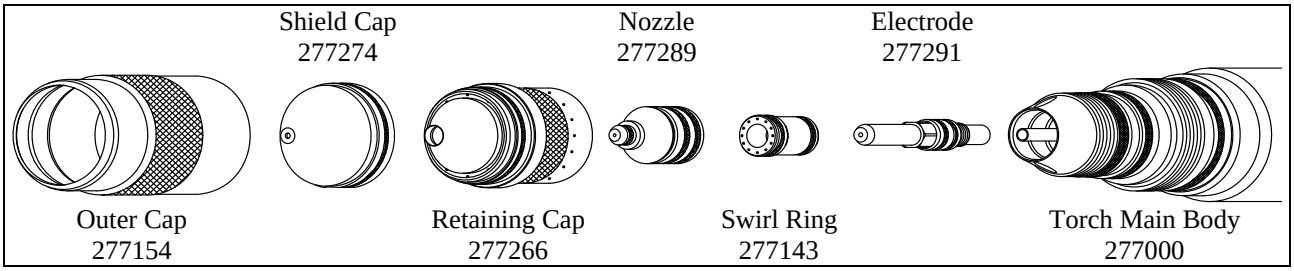
Material Thickness (in)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
1/4	25	75	50	1	145	145	.130	.225	400	.125
3/8					155	115	.185	.275	500	
1/2					165	90	.230		600	.130
5/8					170	65	.250		800	.135
3/4						45		.325	1000	.140

Metric

Material Thickness (mm)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
6	25	75	50	1	143	3770	3.1	5.5	400	3.2
10					156	2825	4.8	7.0	600	
12					162	2430	5.5			3.3
16					170	1630	6.4		1000	3.4
20					170	990		8.6		3.6

1. Revised on 7/2/07

Aluminum - Cutting
200 Amps – Air Plasma / Nitrogen Shield



Imperial

Material Thickness (in)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
1/4	20	82	58	0	150	190	.135	.200	200	.150
3/8					155	145	.140	.250	300	
1/2						110	.135	.300	400	.155
5/8					160	95			500	
3/4						65	.150	.350	600	.160
1.0 **					175	35	.200		400	.170

** Edge start or moving pierce recommended

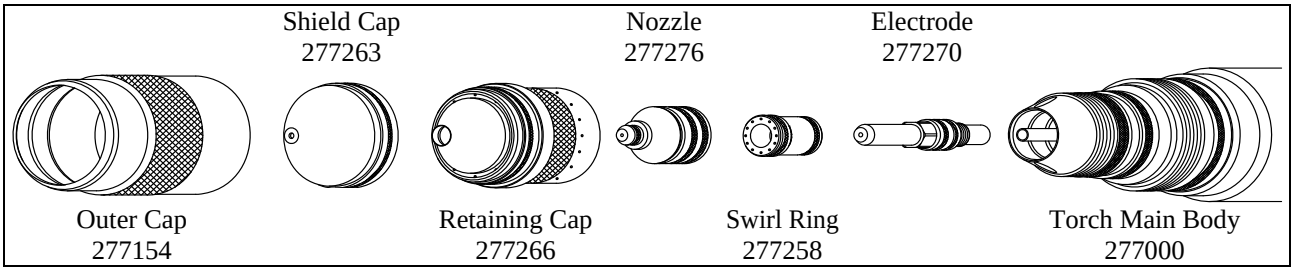
Metric

Material Thickness (mm)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
6	20	82	58	0	149	4955	3.3	4.9	200	3.8
10					155	3545	3.5	6.5	400	
12						2995	3.4	7.3		3.9
16					160	2380		7.6	600	
20					162	1575	3.9	8.9		4.1
25 **					174	940	5.0		400	4.3

** Edge start or moving pierce recommended

1. Revised on 7/2/07

Aluminum - Cutting
275 Amps – Air Plasma / Nitrogen Shield



Imperial

Material Thickness (in)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)	Kerf Width (in)
3/8	20	93	65	0	160	160	.160	.250	400	.160
1/2					165	125	.180	.275	500	
5/8					168	105	.190	.300	600	.165
3/4					172	85	.200	.325	800	
1 **					180	60	.240	.350	400	.170
1.25 **					185	45	.260			
1.5 **					190	25	.270			.180

** Edge start or moving pierce recommended

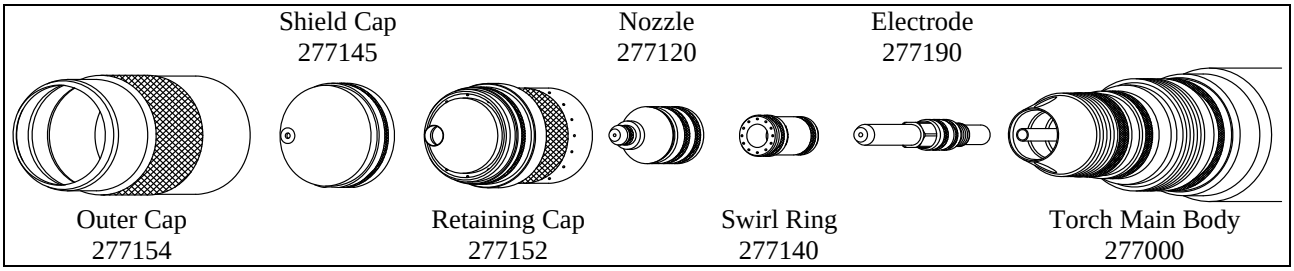
Metric

Material Thickness (mm)	Preflow (Air) (psi)	Plasma (Air) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)	Kerf Width (mm)
10	20	93	65	0	160	3930	4.1	6.4	500	4.1
12					163	3375	4.4	6.8		
16					168	2645	4.8	7.6	800	4.2
20					173	2055	5.3	8.3		
25 **					179	1565	6.0	8.8	400	4.3
32 **					185	1120	6.6	8.9		
38 **					189	645	6.8			4.6

** Edge start or moving pierce recommended

1. Revised on 7/2/07

Mild Steel - Marking
10 Amps – Nitrogen Plasma / Nitrogen Shield



Imperial

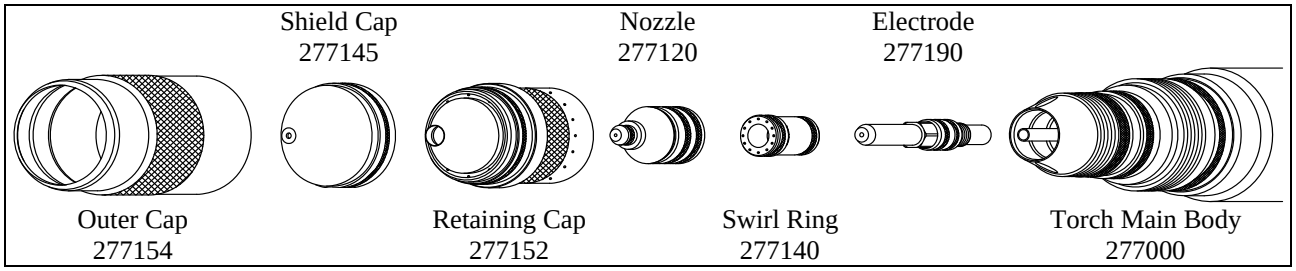
Material Thickness (in)	Preflow (Air) (psi)	Plasma (Nitrogen) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)
All Thicknesses	25	25	20	2	120	150	.050	.050	0

Metric

Material Thickness (mm)	Preflow (Air) (psi)	Plasma (Nitrogen) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)
All Thicknesses	25	25	20	2	120	3810	1.3	1.3	0

1. Revised on 7/2/07

Stainless Steel - Marking
8 Amps – Nitrogen Plasma / Nitrogen Shield



Imperial

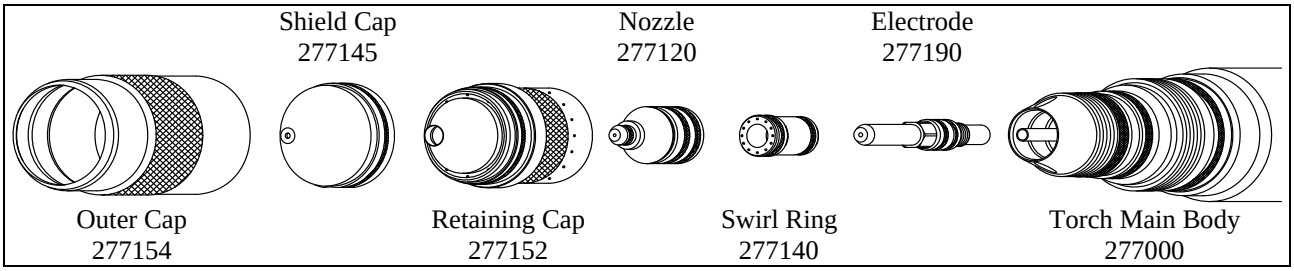
Material Thickness (in)	Preflow (Air) (psi)	Plasma (Nitrogen) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)
All Thicknesses	25	25	20	2	125	150	.050	.050	0

Metric

Material Thickness (mm)	Preflow (Air) (psi)	Plasma (Nitrogen) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)
All Thicknesses	25	25	20	2	125	3810	1.3	1.3	0

1. Revised on 7/2/07

Aluminum - Marking
10 Amps – Nitrogen Plasma / Nitrogen Shield



Imperial

Material Thickness (in)	Preflow (Air) (psi)	Plasma (Nitrogen) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (ipm)	Cutting Height (in)	Pierce Height (in)	Motion Delay (msec)
All Thicknesses	25	25	30	2	120	100	.050	.050	0

Metric

Material Thickness (mm)	Preflow (Air) (psi)	Plasma (Nitrogen) (psi)	Shield (Nitrogen) (psi)	Postflow (Air) (psi)	Arc Voltage (volts)	Travel Speed (mm/m)	Cutting Height (mm)	Pierce Height (mm)	Motion Delay (msec)
All Thicknesses	25	25	30	2	120	2540	1.3	1.3	0

1. Revised on 7/2/07

Section 5 Automatic Gas Console Advanced Functions

This section describes how to operate the FineLine unit when non-standard cutting conditions are desired. Instructions are also given on how to access the various maintenance modes of the system.

Altering the Current Set Point

To alter the current set point from the default setting, use the arrow keys to scroll to Current Set Point, or press the Menu key then the Current key. The current setting should be highlighted as shown in Figure 5-1 and the set point should be blinking. Press F3 to scroll through the available current choices. The current can only be set to values of 30, 50, 70, 100, 150, 200, 260, or 275 amps while cutting and 8, 9, or 10 amps while marking. Once the desired value is blinking, press ENT.

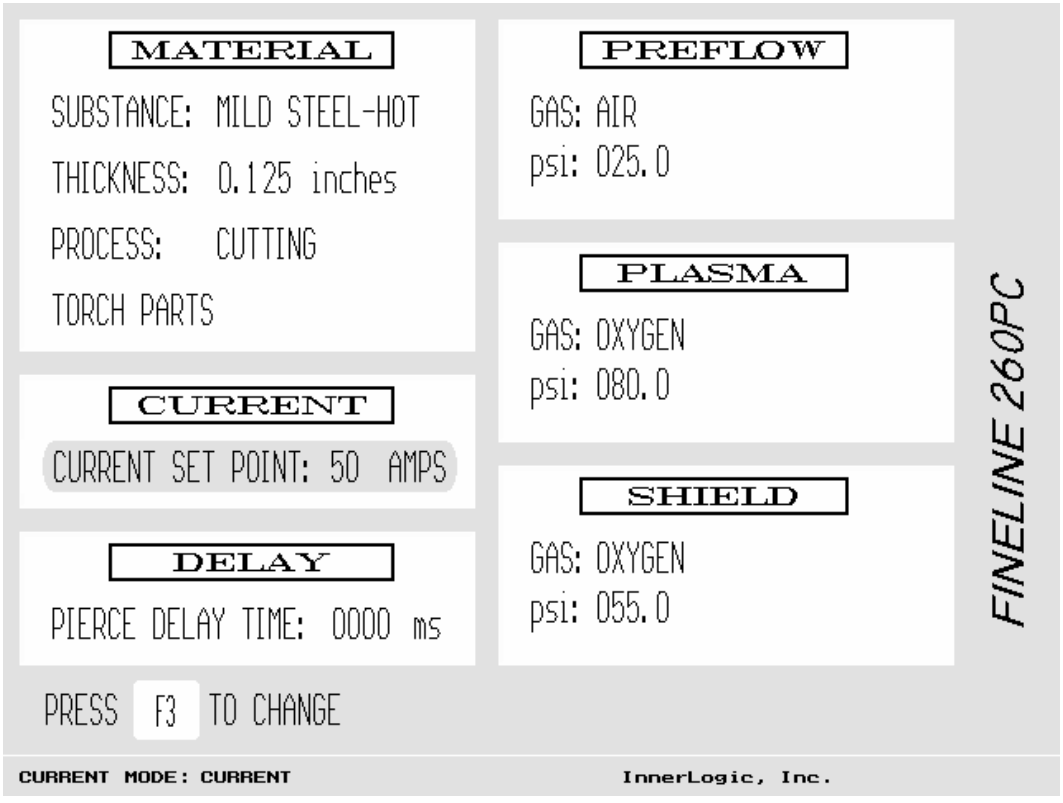


Figure 5-1 Altering the Current Set Point

Setting the Pierce Delay Time

After the FineLine cutting arc transfers to the workpiece, a motion signal (ok to move signal) is sent to the x/y controller or torch height control. The time delay between arc transfer and the motion signal output can be adjusted with the Pierce Delay Time parameter. The pierce delay is usually adjusted so the arc fully penetrates the plate before the motion output signal is generated. Depending on the status of the Default Delay parameter (see below), a default pierce delay time can be automatically retrieved after a material type and thickness are entered, or the delay time can be entered manually. To alter the pierce delay time, use the arrow keys to scroll to Pierce Delay Time. The pierce time should be highlighted as shown in Figure 5-2 and the editing cursor should be blinking. Use the numerical keypad to enter the desired pierce delay time. Note that the units are in milliseconds (1000 milliseconds = 1 second). Use the CLR key to backspace if an error is made. When the correct value has been entered, press ENT. Note that the maximum allowable pierce delay time is 5000 milliseconds (5 seconds).

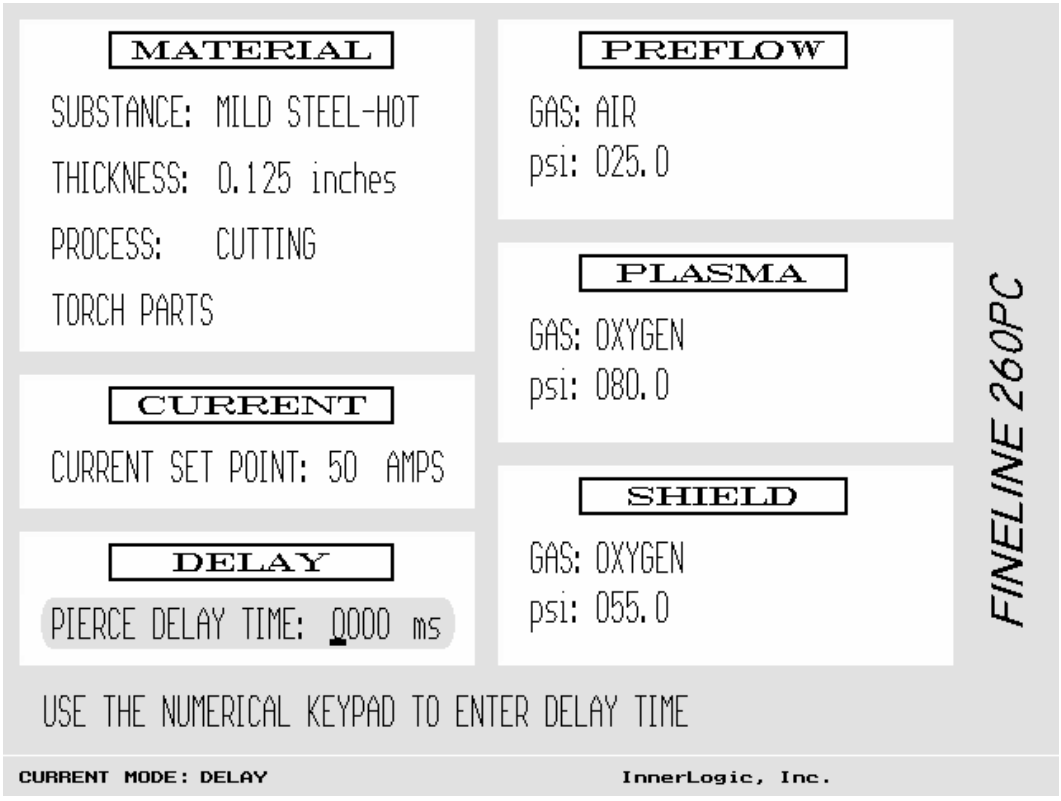


Figure 5-2 Setting the Pierce Delay Time

Altering Gas Types

Although the gas types should not normally be changed, the procedure is given here anyway. Note that the preflow gas cannot be changed. To alter the gas types used for a particular cut, use the arrows to scroll to the appropriate gas or press the Menu key then the Plasma Gas or Shielding Gas key. The appropriate gas selection should be highlighted as shown in Figure 5-3, and the present gas choice should be blinking. Press F3 to scroll through the gas choices. When the desired gas type is blinking, press ENT to accept the gas type. The plasma gas can be changed to air, oxygen, or nitrogen and the shield gas can be changed to air, oxygen, nitrogen, or alternate.

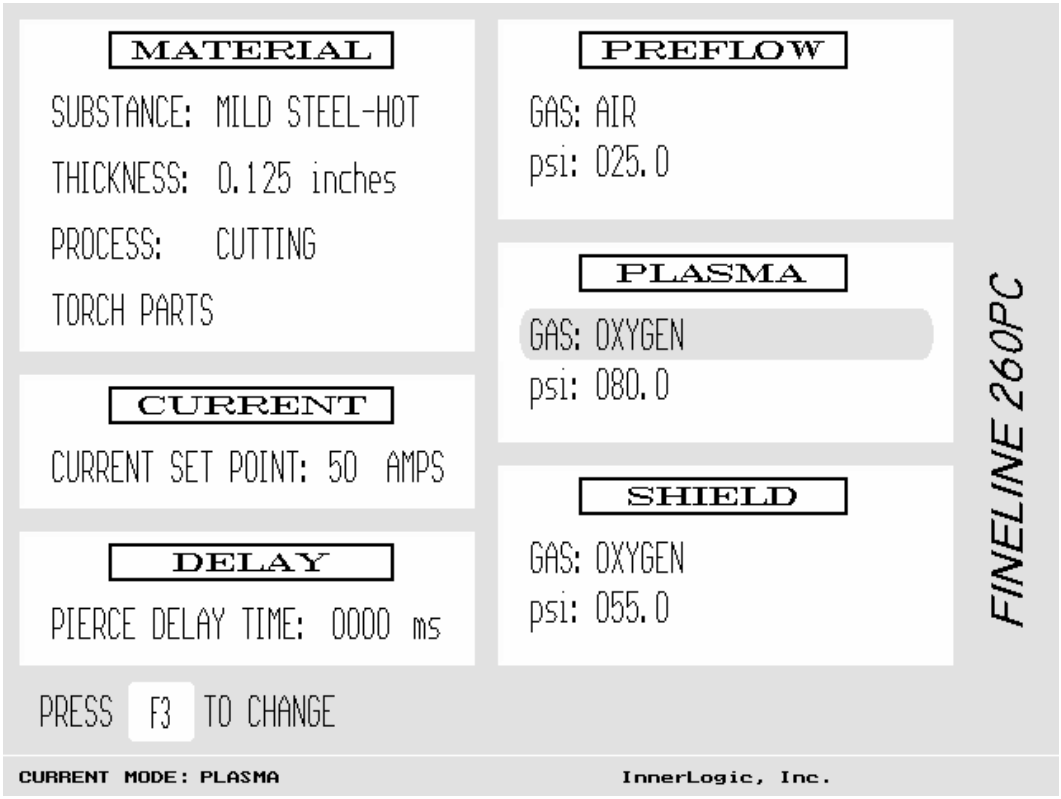


Figure 5-3 Altering Gas Types

Altering Gas Pressures

Normally, the preflow gas and plasma gas pressures should not be changed. The shield gas is normally adjusted in small increments to fine-tune a cut. To alter the gas pressures, use the arrow keys to scroll to the appropriate pressure setting. The pressure setting should be highlighted as shown in Figure 5-4 and the editing cursor should be blinking. Use the numerical keypad to enter the desired operating pressure. Use the CLR key to backspace if an error is made. Press ENT when the correct value has been entered. Note that all of the gases have minimum and maximum limits and cannot be programmed beyond these limits.

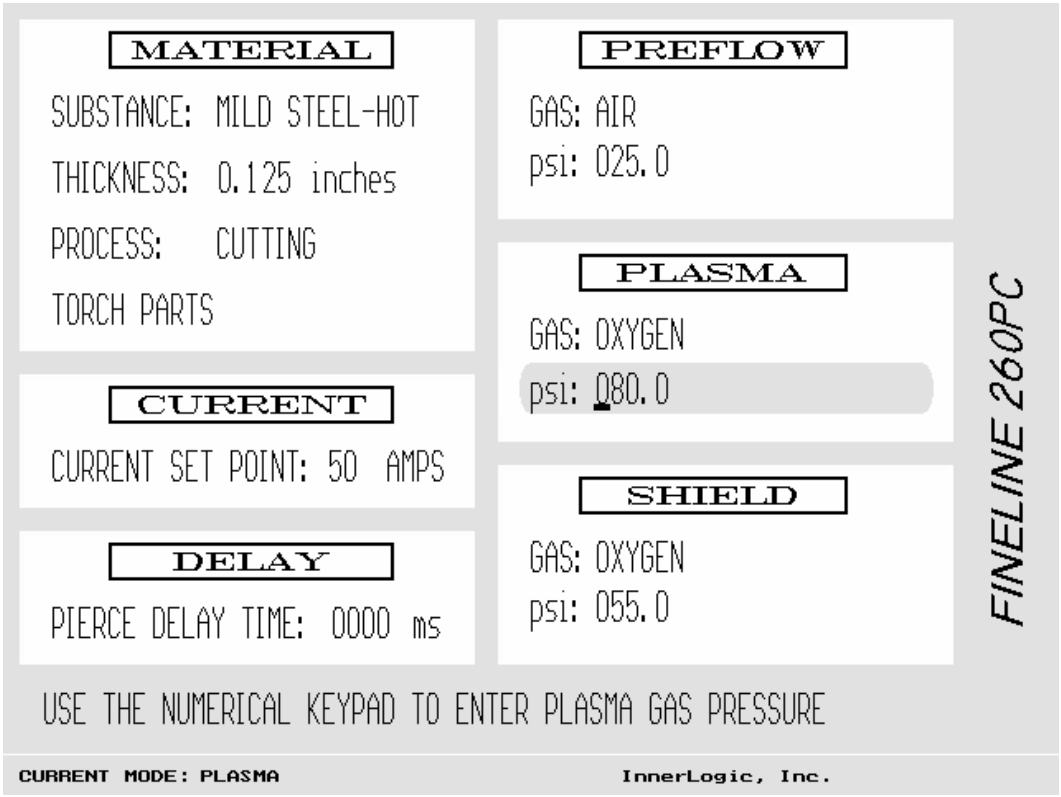


Figure 5-4 Altering Gas Pressures

Altering Arc Voltage Control and X/Y Machine Parameters

If the pierce height, cutting height, arc voltage, or x/y machine speed must be altered to achieve the desired cut quality, switch to the voltage screen, use the arrow keys to scroll to the desired parameter, and edit the parameter using the keypad.

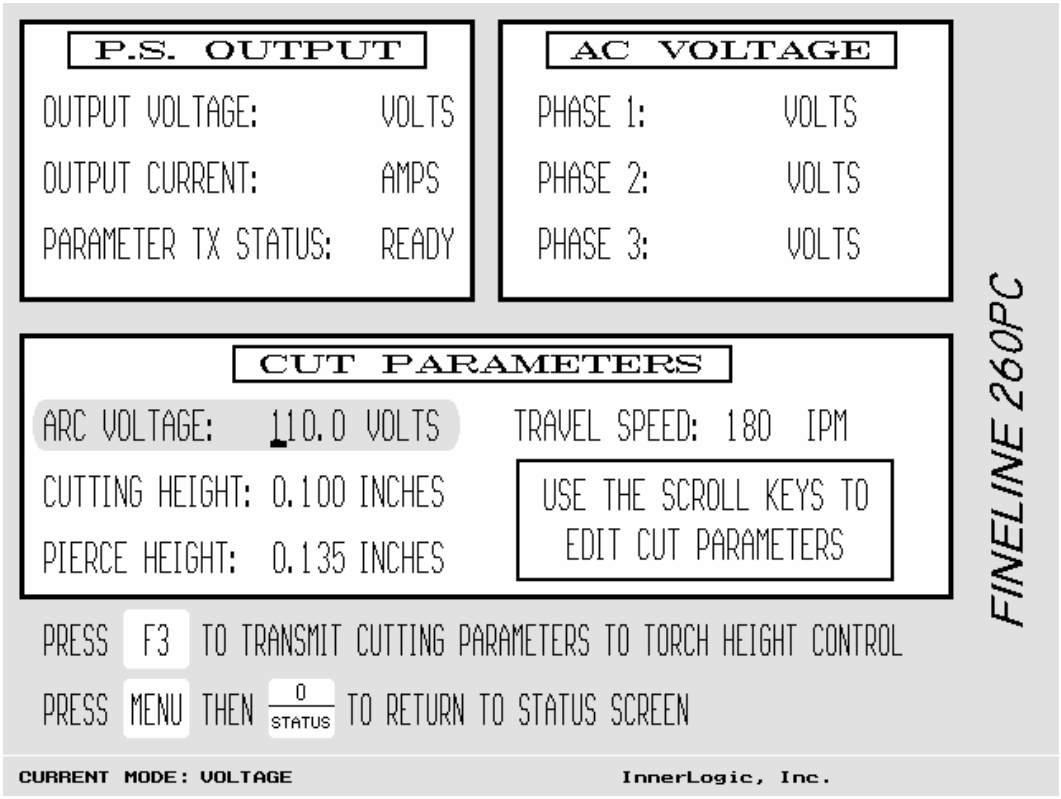

P.S. OUTPUT
OUTPUT VOLTAGE: VOLTS
OUTPUT CURRENT: AMPS
PARAMETER TX STATUS: READY
AC VOLTAGE
PHASE 1: VOLTS
PHASE 2: VOLTS
PHASE 3: VOLTS
CUT PARAMETERS
ARC VOLTAGE: 110.0 VOLTS
TRAVEL SPEED: 180 IPM
CUTTING HEIGHT: 0.100 INCHES
PIERCE HEIGHT: 0.135 INCHES
USE THE SCROLL KEYS TO EDIT CUT PARAMETERS
FINELINE 260PC
PRESS F3 TO TRANSMIT CUTTING PARAMETERS TO TORCH HEIGHT CONTROL
PRESS MENU THEN 0 STATUS TO RETURN TO STATUS SCREEN
CURRENT MODE: VOLTAGE
InnerLogic, Inc.

Figure 5-5 Altering Arc Voltage Control and X/Y Machine Parameters

Saving a User Created Cutting Condition

If one of the default cutting parameters must be altered to achieve good cut quality, the new cutting condition can be saved for later use. To save a user created cutting condition, use the arrow keys to scroll off all selections on the status screen. When none of the parameters are highlighted the "Press F3 to Save Settings" message will be displayed as shown in Figure 5-6. Pressing F3 will cause the save confirmation window to pop up. When this occurs, press ENT to save the condition or press CLR to cancel the procedure. Pressing ENT will save the settings for the particular material being cut and a User icon will appear in the upper right hand corner of the screen. The User icon indicates that the parameters for the particular material being cut are not factory defaults but are user created. The factory default condition can be restored as described later in this section.

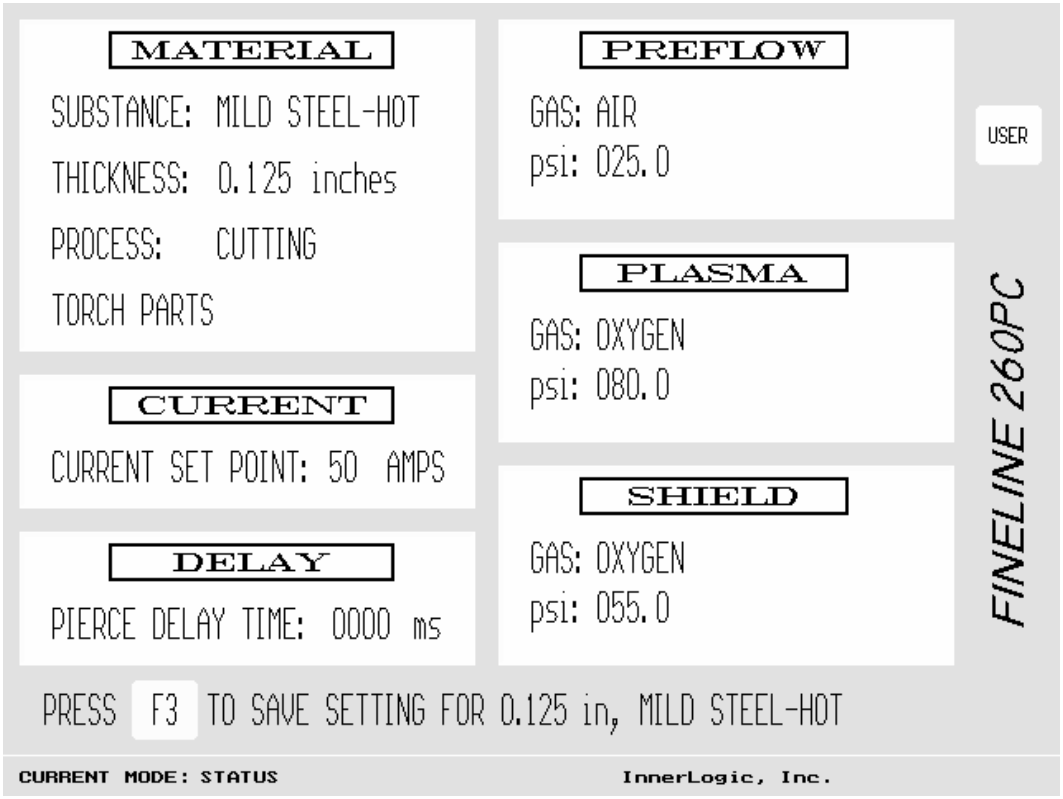


Figure 5-6 User Created Cutting Conditions

Gas Purge

The gas lines can be purged at any time by pressing the Menu key then the Gas Purge key. Also, the gas pressures are readjusted at this time.

Maintenance Screen

To display the maintenance screen, press the Menu key then the Maint key. The maintenance screen will be displayed as shown in Figure 5-7. From the maintenance screen, use the arrow keys to scroll up or down to highlight a selection and press the Ent key to enter the desired maintenance mode. The different maintenance modes are described below.

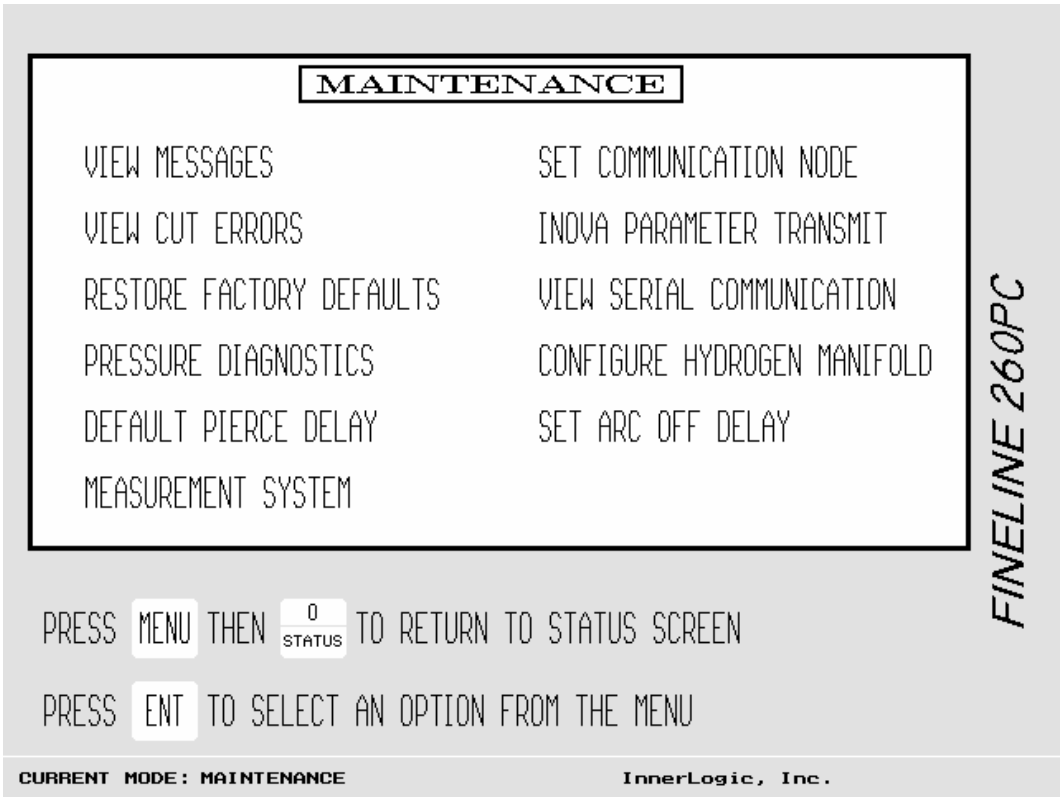


Figure 5-7 Maintenance Screen

Viewing Messages

To view status messages from the FineLine power supply and automatic gas console, scroll down to the View Messages selection on the maintenance screen and press ENT. The message screen will be displayed as shown in Figure 5-8. The message screen displays all power supply and gas console messages, sequencing, and errors. The message screen should be the initial starting point when troubleshooting the system.

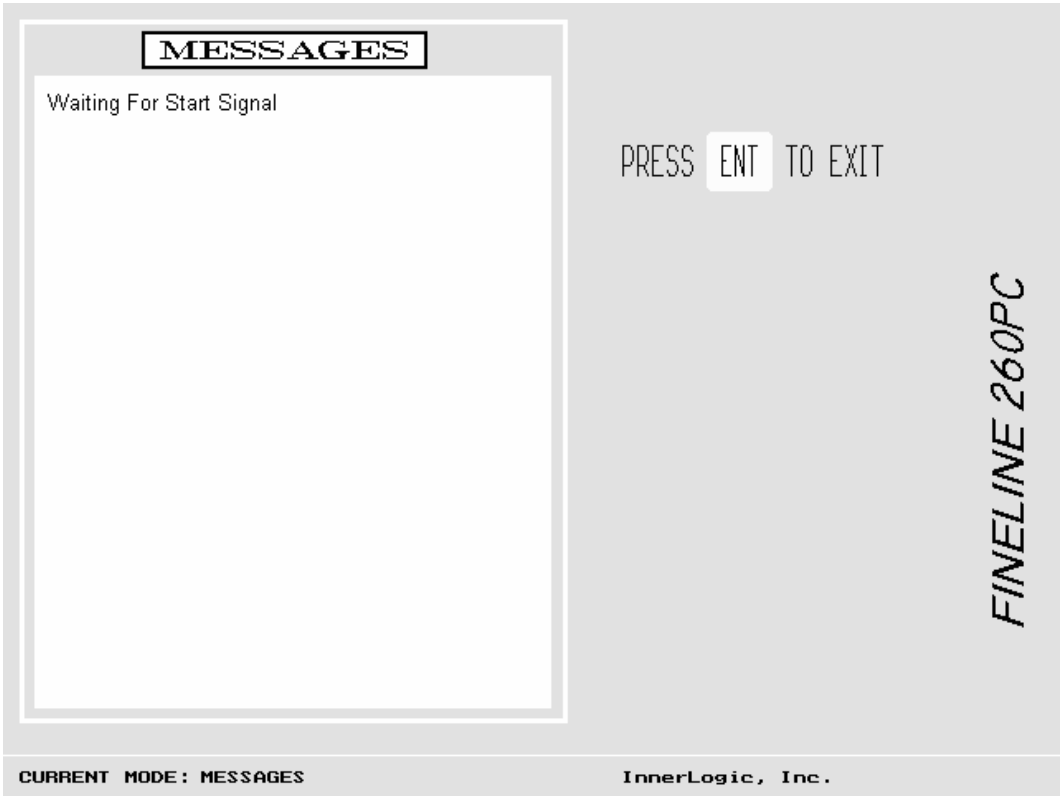


Figure 5-8 Message Screen

Viewing Cut Errors

The FineLine has an error tracking system that keeps a record of certain cutting faults that occur during operation. These faults affect the consumable parts life and measures should be taken to prevent them from occurring. To view the cut errors, scroll down to the View Cut Errors selection on the maintenance screen and press ENT. The cut errors screen will be displayed as shown in Figure 5-9. The error tracking system keeps a record of the total number of pierces, the number of errors, and the error percentage. Any time the consumables are changed, the pierce counter should be reset to zero by pressing CLR. When this occurs, the data from the present count will move into the first previous errors position. The data that was in the first previous errors position will move to the second previous errors position, and so on.

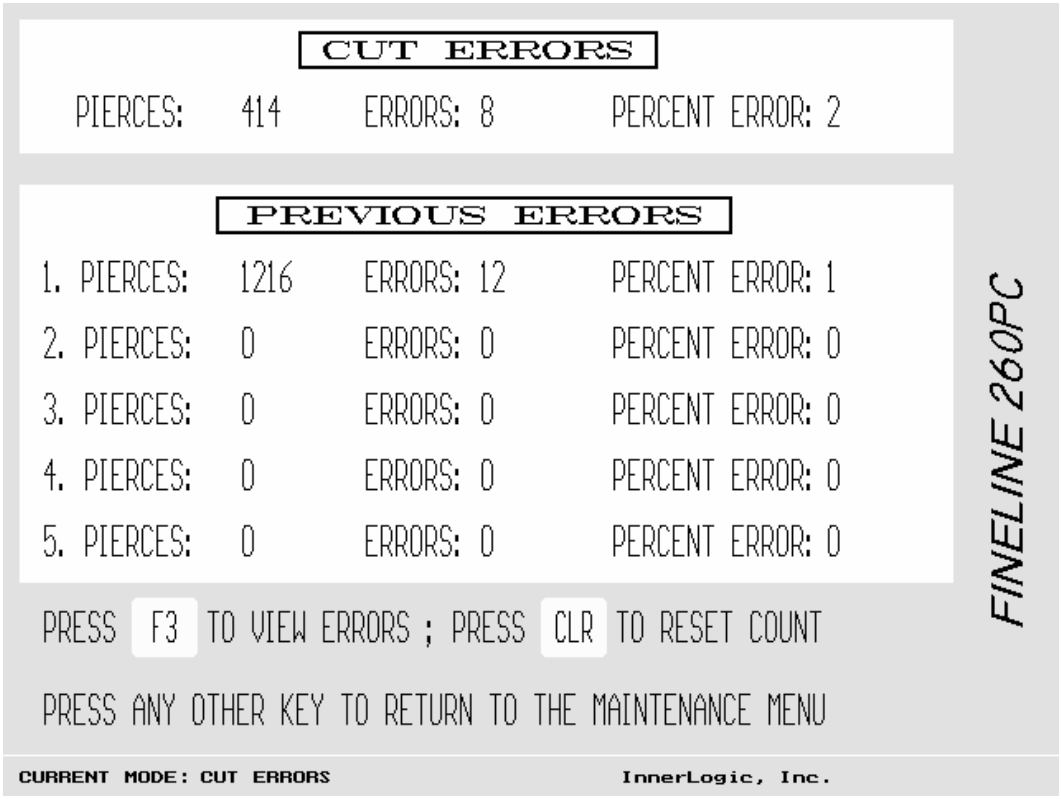

CUT ERRORS
PIERCES: 414 ERRORS: 8 PERCENT ERROR: 2
PREVIOUS ERRORS
1. PIERCES: 1216 ERRORS: 12 PERCENT ERROR: 1
2. PIERCES: 0 ERRORS: 0 PERCENT ERROR: 0
3. PIERCES: 0 ERRORS: 0 PERCENT ERROR: 0
4. PIERCES: 0 ERRORS: 0 PERCENT ERROR: 0
5. PIERCES: 0 ERRORS: 0 PERCENT ERROR: 0
FINELINE 260PC
PRESS F3 TO VIEW ERRORS ; PRESS CLR TO RESET COUNT
PRESS ANY OTHER KEY TO RETURN TO THE MAINTENANCE MENU
CURRENT MODE: CUT ERRORS
InnerLogic, Inc.

Figure 5-9 Cut Errors Screen

Selecting an Error Set to View

When the cut errors screen is being displayed, press F3 to view the actual cut errors. When F3 is pressed the error selection screen is displayed as shown in Figure 5-10. Use the arrow keys to scroll to the error set that is to be viewed and press ENT.

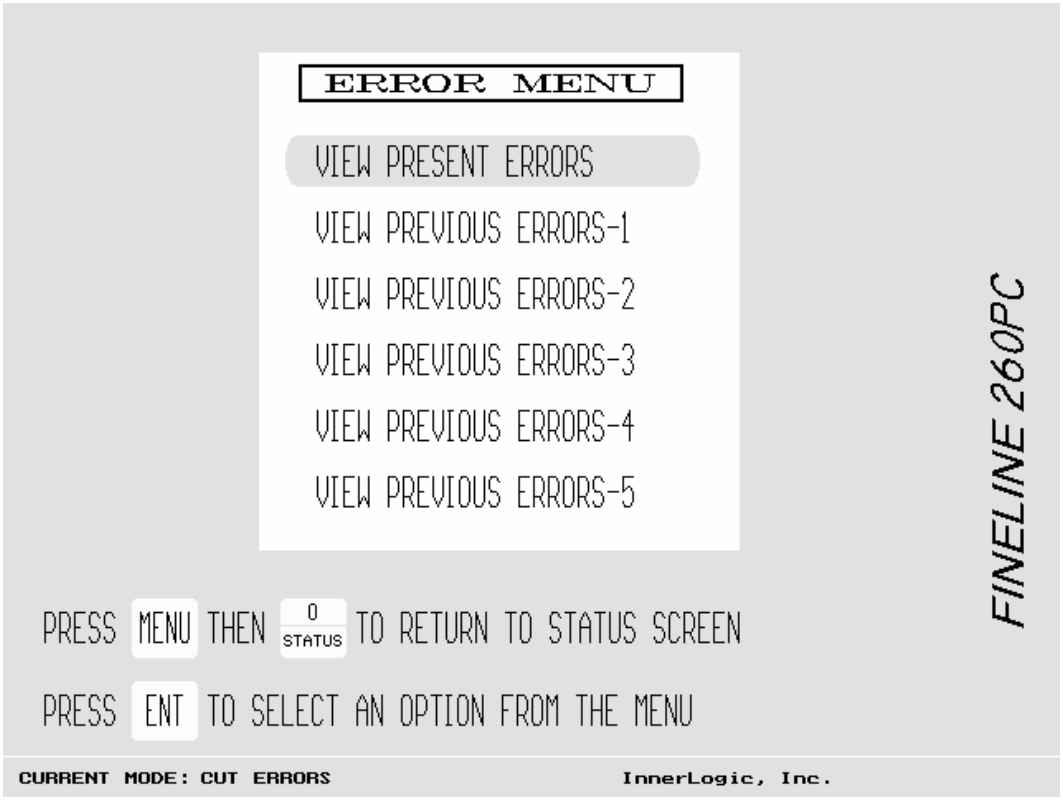


Figure 5-10 Error Selection Screen

Viewing Actual Errors

Once the error set is selected and the ENT key is pressed on the error selection screen, the actual cut errors will be displayed as shown in Figure 5-11.

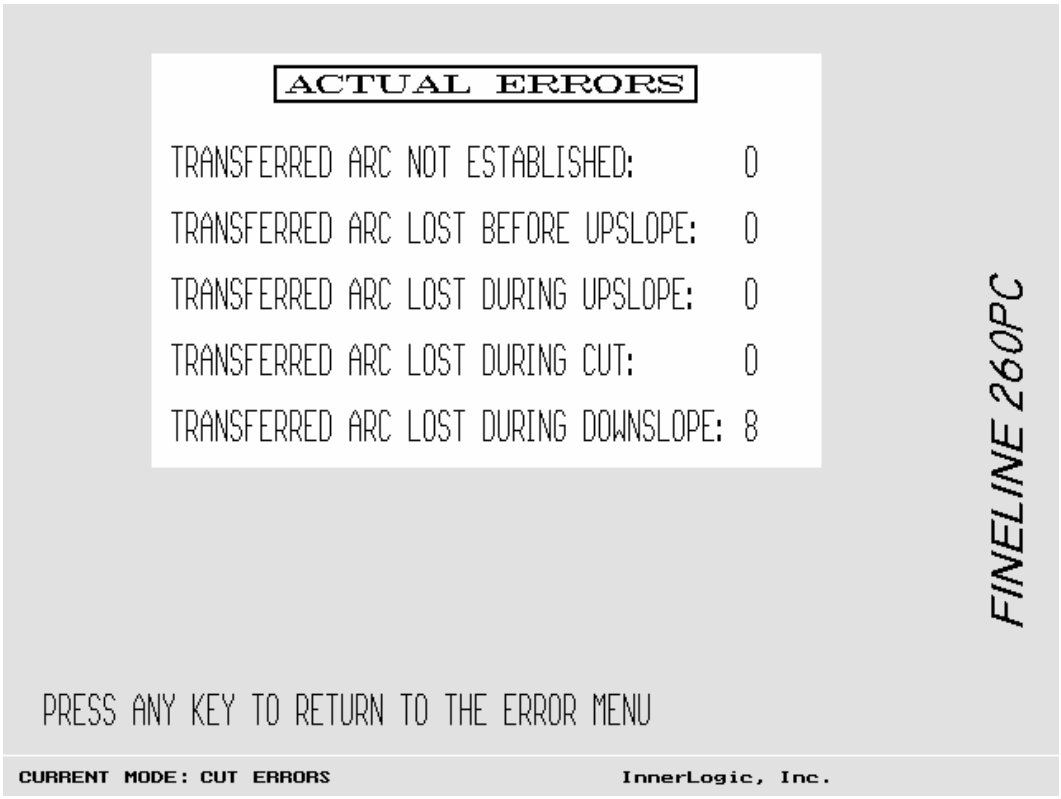

ACTUAL ERRORS
TRANSFERRED ARC NOT ESTABLISHED: 0
TRANSFERRED ARC LOST BEFORE UPSLOPE: 0
TRANSFERRED ARC LOST DURING UPSLOPE: 0
TRANSFERRED ARC LOST DURING CUT: 0
TRANSFERRED ARC LOST DURING DOWNSLOPE: 8
FINELINE 260PC
PRESS ANY KEY TO RETURN TO THE ERROR MENU
CURRENT MODE: CUT ERRORS
InnerLogic, Inc.

Figure 5-11 Actual Cut Errors Screen

When any of the errors listed on the actual cut errors screen occur, measures should be taken to avoid further errors. The following is a description of the errors and possible causes:

- **Transferred arc not established** - This error occurs when the cutting arc fails to transfer to the workpiece. It primarily causes nozzle damage and is typically due to a pierce height that is too high.
- **Transferred arc lost before upslope** - This error occurs when the cutting arc transfers to the workpiece but is lost immediately. It primarily causes nozzle damage and is typically due to a pierce height that is too high.
- **Transferred arc lost during upslope** - This error occurs when the arc transfers to the workpiece but is lost before steady state operation. It primarily causes electrode damage and is typically due to a pierce time that is too long or when cutting a given thickness with excessive current.
- **Transferred arc lost during cut** - This error occurs when the arc is lost during steady state operation. It substantially shortens the electrode life and is typically due to a torch standoff distance that is too high or a travel speed that is to slow.

- **Transferred arc lost during downslope** - This error occurs when the arc is lost after a stop signal is received but before the current downslope completes. It substantially shortens the electrode life and is typically due to an incorrect lead-out or when cutting a given material thickness with excessive current. When cutting small pieces that tend to drop into the table after being cut, there should be a very short lead out or none at all. On thicker materials, the arc is sometimes lost when crossing the kerf during the lead out. **It is critical that the lead-outs be fine tuned so the arc is not lost before downslope is complete.**

Pressure Diagnostics

To enter the pressure diagnostics mode, scroll down to the Pressure Diagnostics selection on the maintenance screen and press ENT. The pressure diagnostics screen will be displayed as shown in Figure 5-12. Pressing the Preflow Gas, Plasma Gas, and Shielding Gas buttons will toggle the corresponding valves between the off and on states. Note that the preflow valve and the plasma valve cannot be on at the same time. Also, if a particular regulator is adjusting, the corresponding valve status will display N/A.

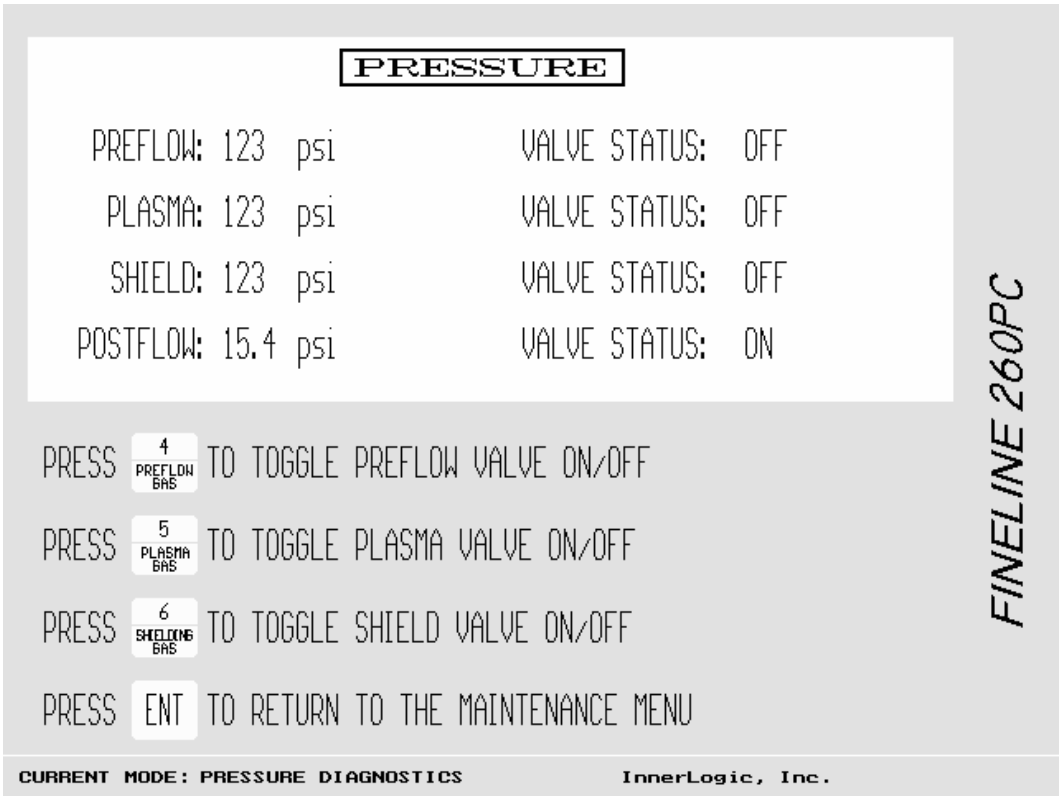

PRESSURE
PREFLOW: 123 psi
VALVE STATUS: OFF
PLASMA: 123 psi
VALVE STATUS: OFF
SHIELD: 123 psi
VALVE STATUS: OFF
POSTFLOW: 15.4 psi
VALVE STATUS: ON
PRESS 4 PREFLOW GAS TO TOGGLE PREFLOW VALVE ON/OFF
PRESS 5 PLASMA GAS TO TOGGLE PLASMA VALVE ON/OFF
PRESS 6 SHIELDING GAS TO TOGGLE SHIELD VALVE ON/OFF
PRESS ENT TO RETURN TO THE MAINTENANCE MENU
FINELINE 260PC
CURRENT MODE: PRESSURE DIAGNOSTICS
InnerLogic, Inc.

Figure 5-12 Pressure Diagnostics Screen

Setting the Default Delay Parameter

As previously mentioned, the pierce delay time is usually adjusted such that the cutting arc fully penetrates the workpiece before the motion output signal is generated. If the pierce delay time is set via the x/y machine controller, the Default Delay parameter on the FineLine must be disabled. When the Default Delay parameter is enabled, a pierce delay time is automatically retrieved after a material type and thickness are entered. Note that when the Default Delay parameter is disabled, the present Pierce Delay Time will be used for all cutting conditions. Make sure the Pierce Delay Value is set to zero (or another chosen value) after the Default Delay parameter is disabled. To view the status of the Default Delay parameter, scroll down to the Default Delay selection on the maintenance screen and press ENT. The default delay screen will be displayed as shown in Figure 5-13. Pressing F3 will toggle the Default Delay parameter between enabled and disabled.

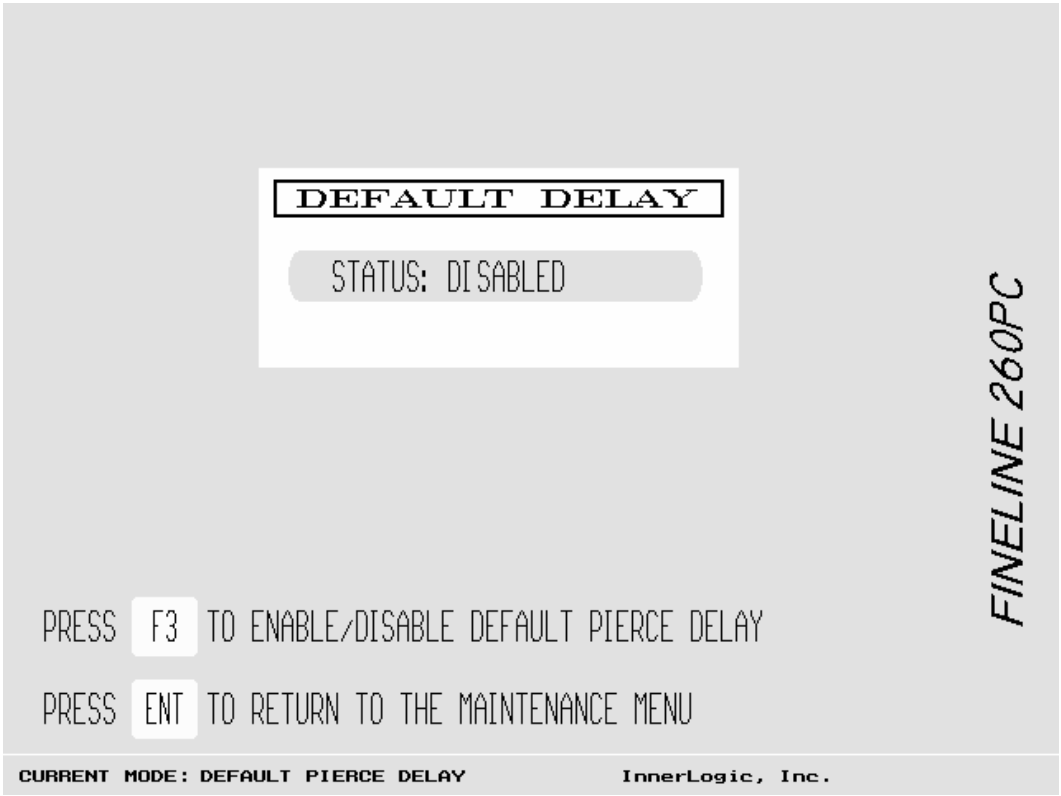

DEFAULT DELAY
STATUS: DISABLED
FINELINE 260PC
PRESS F3 TO ENABLE/DISABLE DEFAULT PIERCE DELAY
PRESS ENT TO RETURN TO THE MAINTENANCE MENU
CURRENT MODE: DEFAULT PIERCE DELAY
InnerLogic, Inc.

Figure 5-13 Default Pierce Delay Screen

Restoring Factory Default Cutting Conditions

To restore a factory default cutting condition, scroll down to the Restore Factory Defaults selection on the maintenance screen and press ENT. The restore screen will be displayed as shown in Figure 5-14. Note that the present material type and thickness selected on the status screen will be automatically displayed on the restore screen. Press ENT to restore the factory default setting for the material type and thickness displayed. To change the material type, press the F3 key. To edit the material thickness, use the arrow keys to scroll to Thickness and use the numerical keypad to enter the thickness. To restore the factory default cutting condition for all user saved files, press 1, then 2, then 3 as shown on the screen below. To restore corrupted cutting conditions, press 7, then 8, then 9 as shown on the screen below.

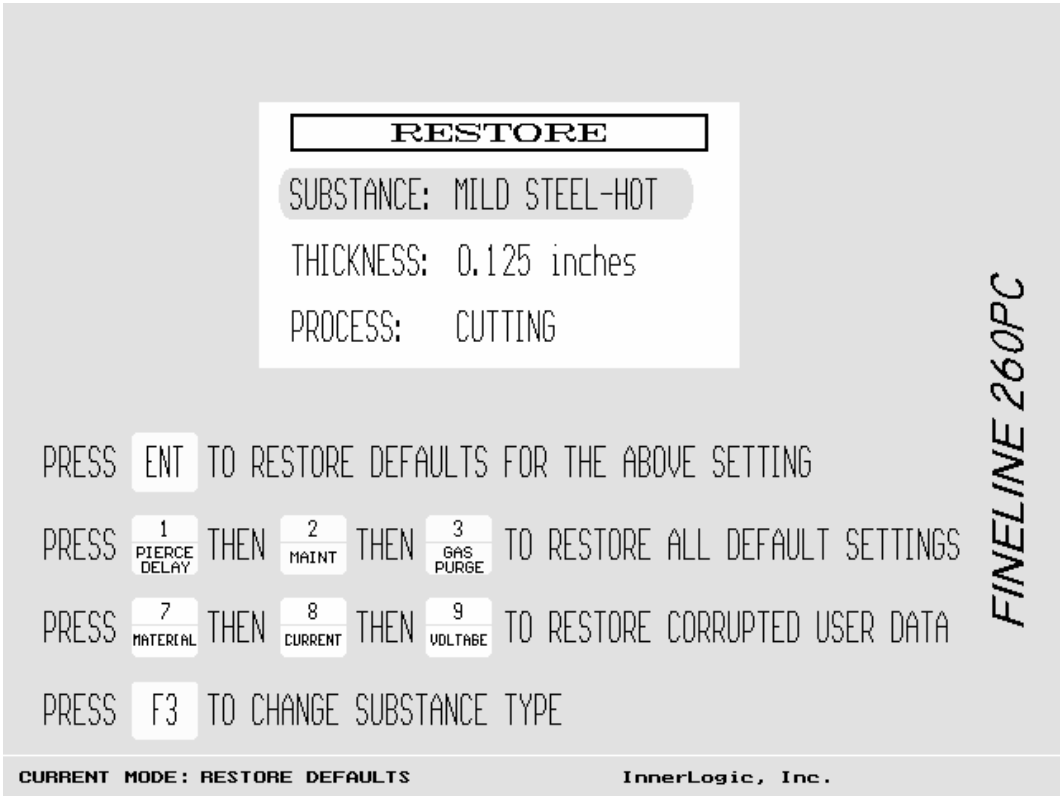

RESTORE
SUBSTANCE: MILD STEEL-HOT
THICKNESS: 0.125 inches
PROCESS: CUTTING
PRESS ENT TO RESTORE DEFAULTS FOR THE ABOVE SETTING
PRESS 1 PIERCE DELAY THEN 2 MAINT THEN 3 GAS PURGE TO RESTORE ALL DEFAULT SETTINGS
PRESS 7 MATERIAL THEN 8 CURRENT THEN 9 VOLTAGE TO RESTORE CORRUPTED USER DATA
PRESS F3 TO CHANGE SUBSTANCE TYPE
FINELINE 260PC
CURRENT MODE: RESTORE DEFAULTS
InnerLogic, Inc.

Figure 5-14 Restore Factory Defaults Screen

Measurement System

The FineLine system will operate using Imperial units or Metric units. To change the units of operation, scroll down to the Measurement System selection on the maintenance screen and press ENT. The measurement system screen will be displayed as shown in Figure 5-15. Press F3 to toggle the measurement system between Imperial and Metric.

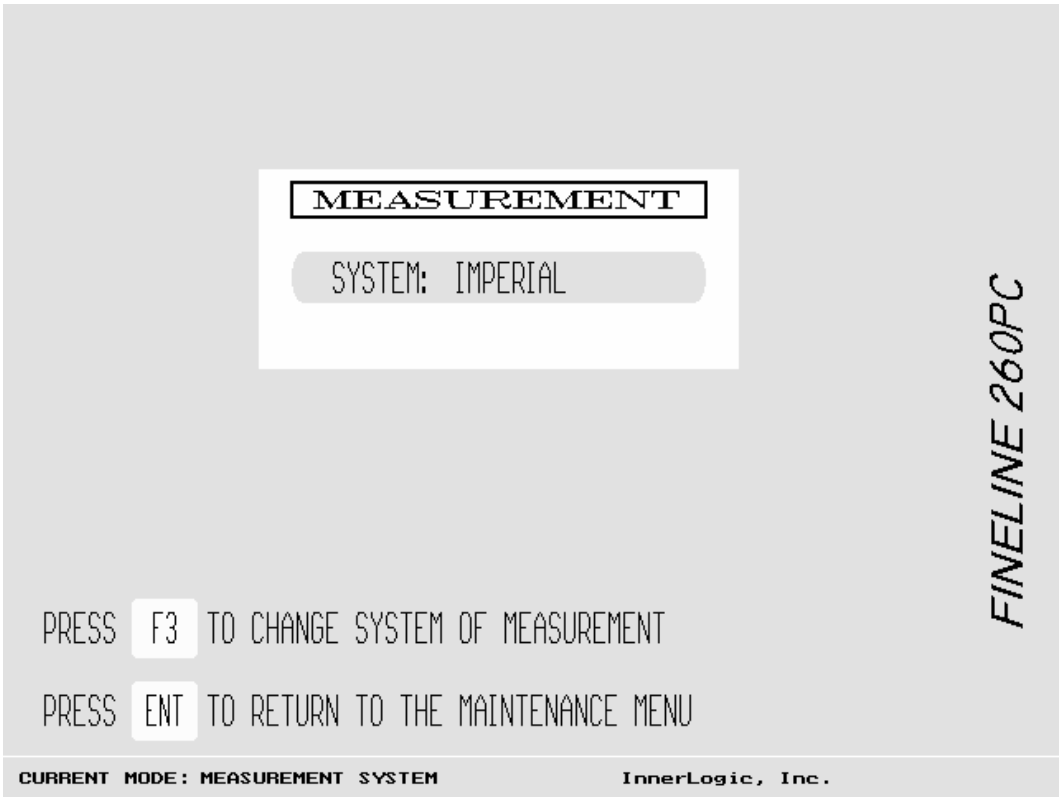


Figure 5-15 Measurement System Selection Screen

Communication Node

When multiple FineLine systems are being used together on an RS-422 serial communication link, each system must have a unique identification number (node number) to identify itself to the network. To set the communication node number for the FineLine system, scroll down to the Set Communication Node selection on the maintenance screen and press ENT. The communication node selection screen will be displayed as shown in Figure 5-16. Press F3 to scroll through the available node numbers. When using an Inova torch height control system with the FineLine, the communication node feature must be disabled. To disable the communication node, press F3 until "disabled" is displayed in the node number selection box.

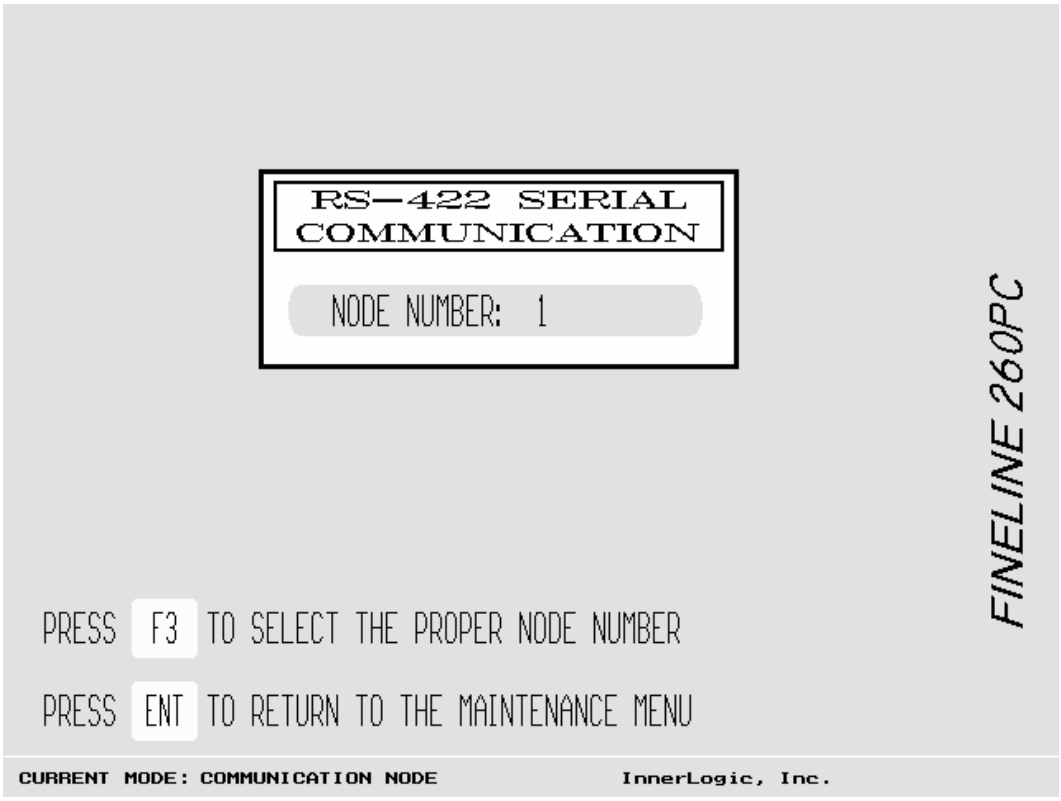

RS-422 SERIAL COMMUNICATION
NODE NUMBER: 1
FINELINE 260PC
PRESS F3 TO SELECT THE PROPER NODE NUMBER
PRESS ENT TO RETURN TO THE MAINTENANCE MENU
CURRENT MODE: COMMUNICATION NODE
InnerLogic, Inc.

Figure 5-16 Communication Node Selection Screen

Inova Parameter Transmit

If an Inova arc voltage control system is not being used with the FineLine system, the Inova Parameter Transmit feature must be disabled. With the Inova Parameter Transmit feature enabled, pressing F3 while the voltage screen is being displayed will automatically transmit the pierce height, cutting height, and arc voltage set points to the Inova arc voltage control. To view the status of the Inova Parameter Transmit setting, scroll down to the Inova Parameter Transmit selection on the maintenance screen and press ENT. The Inova parameter transmit screen will be displayed as shown in Figure 5-17. Pressing F3 will toggle the Inova Parameter Transmit setting between enabled and disabled.

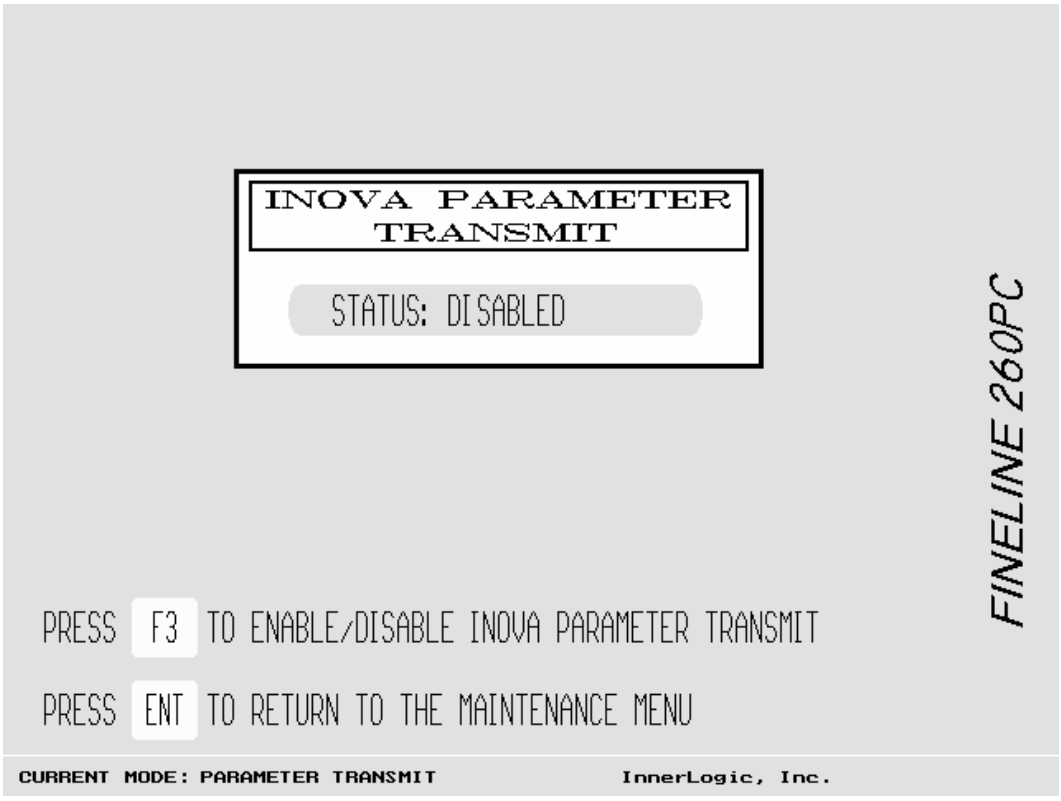

INOVA PARAMETER TRANSMIT
STATUS: DISABLED
FINELINE 260PC
PRESS F3 TO ENABLE/DISABLE INOVA PARAMETER TRANSMIT
PRESS ENT TO RETURN TO THE MAINTENANCE MENU
CURRENT MODE: PARAMETER TRANSMIT
InnerLogic, Inc.

Figure 5-17 Inova Parameter Transmit Screen

Viewing Serial Communications

To view the serial communication between the FineLine and an external device, scroll down to the View Serial Communication selection on the Maintenance screen and press enter. The Serial Communication screen will be displayed as shown in Figure 5-18. All incoming and outgoing data is displayed in decimal (base 10) format. Note that incoming data is appended to show an "R" before the data and outgoing transmissions are appended to show a "T" before the data. Pressing F3 will toggle the display on and off and pressing CLR will clear the screen.

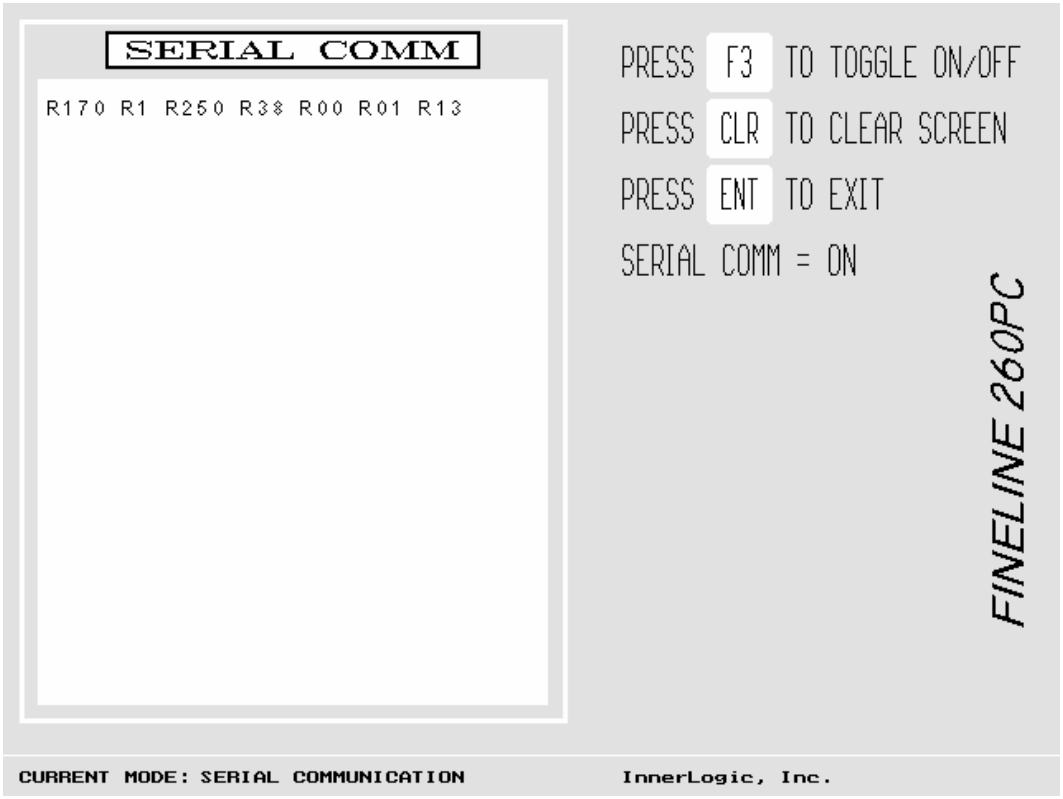


Figure 5-18 View Serial Communication Screen

Configuring the Optional Hydrogen Manifold

When a hydrogen manifold is installed on the system, the hydrogen mixture will automatically be selected as the plasma gas for certain material types and thicknesses. To prevent the use of hydrogen, the hydrogen manifold must be disabled. To disable the hydrogen manifold, scroll down to the Configure Hydrogen Manifold selection on the Maintenance Screen and press enter. The Configure Hydrogen Manifold screen will be displayed as shown in Figure 5-19. Pressing F3 will toggle the Hydrogen Manifold setting between enabled and disabled.

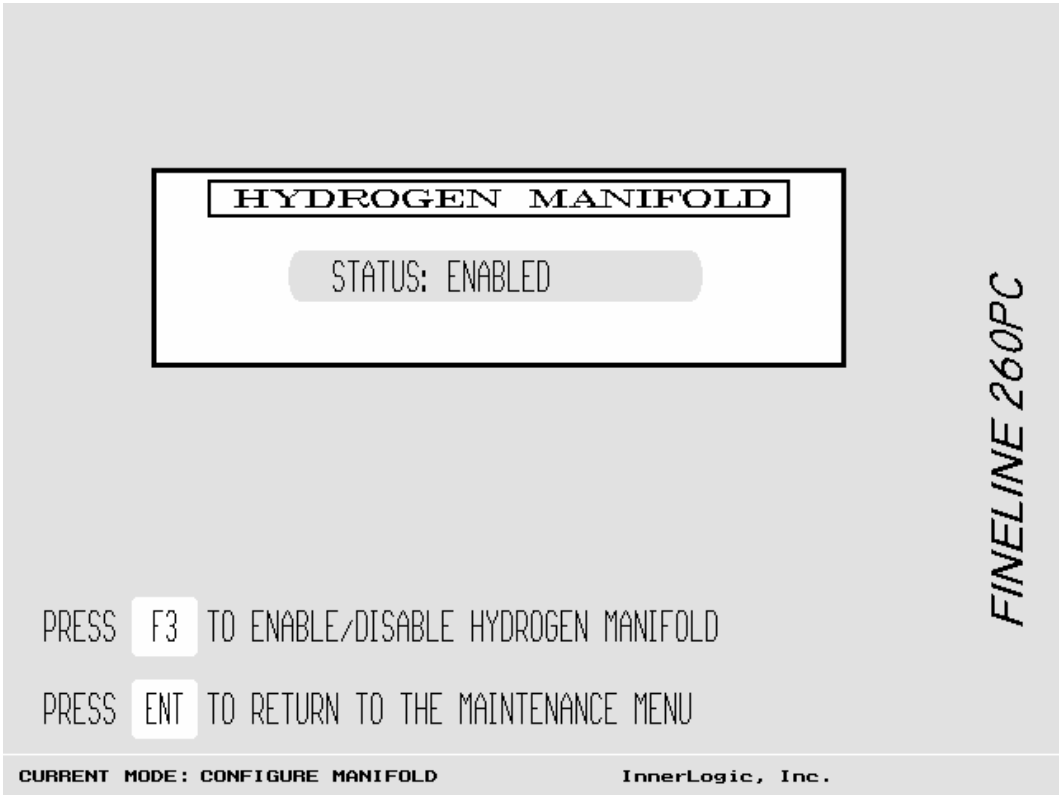


Figure 5-19 Configure Hydrogen Manifold Screen

Setting an Arc Off Delay

In some instances, such as when cutting thicker stainless steel materials, it may be desirable to delay the extinction of the cutting arc after a stop signal is received. To program an arc off delay, scroll down to the Set Arc Off Delay selection on the Maintenance Screen and press enter. The Set Arc Off Delay screen will be displayed as shown in Figure 5-20. Use the keypad to enter the desired delay time in milliseconds. The delay can be set from 0 to 2000 mS.

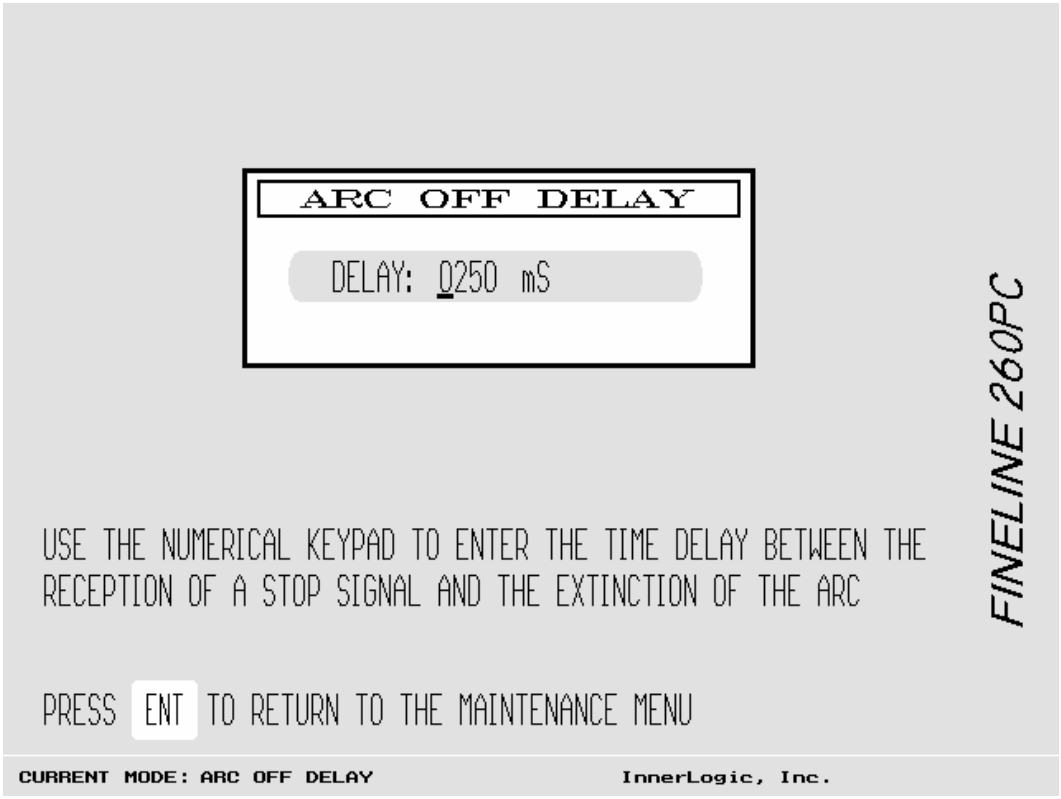

ARC OFF DELAY
DELAY: 0250 mS
FINELINE 260PC
USE THE NUMERICAL KEYPAD TO ENTER THE TIME DELAY BETWEEN THE RECEPTION OF A STOP SIGNAL AND THE EXTINCTION OF THE ARC
PRESS ENT TO RETURN TO THE MAINTENANCE MENU
CURRENT MODE: ARC OFF DELAY
InnerLogic, Inc.

Figure 5-20 Set Arc Off Delay Screen

Software Updates

The Automatic Gas Console has a floppy disk drive that is used to update the software as new revisions are released. To access the floppy disk drive, remove the floppy disk drive cover on the rear panel of the console. The software update may either be installed on one floppy disk or two floppy disks. Follow the instructions below for the appropriate update.

One-Disk Update

1. Remove primary power from the FineLine system.
2. Insert the floppy disk containing the software update into the floppy disk drive.
3. Apply primary power to the system and wait until the "AGC Updated Successfully" message appears.
4. Remove the floppy disk from the floppy disk drive.
5. Remove primary power from the system.
6. Reinstall the floppy disk drive cover.
7. Apply primary power to the system.

Two-Disk Update

1. Remove primary power from the FineLine system
2. Insert the first floppy disk containing the software update into the floppy disk drive.
3. Apply primary power to the system and wait until the "AGC Updated Successfully" message appears.
4. Remove the floppy disk from the floppy disk drive.
5. Remove primary power from the system, wait five seconds, then reapply primary power to the system.
6. Wait for the "Please Insert Update Disk 2" message to appear.
7. Install the second floppy disk containing the software update into the floppy disk drive.
8. Press any key on the keypad.
9. Wait for the "AGC Updated Successfully" message to appear.
10. Leave the second update disk in the floppy disk drive, remove primary power from the system, wait five seconds, then reapply primary power.
11. Wait for the "AGC Updated Successfully" message to appear.
12. Remove the floppy disk from the floppy disk drive.
13. Remove primary power from the system.
14. Reinstall the floppy disk drive cover.
15. Apply primary power to the system.

Section 6 Serial Communication

Initializing the FineLine System

The FineLine system uses an RS-422 serial communication port located on the rear of the automatic gas console to receive and respond to commands that are transmitted from an x/y controller. The system communicates at 9600 baud with RS-422 levels generally between 0 and 5 volts, although the system is rated for the full protocol range of -7 to +12 volts. The communications ground is isolated to prevent ground loops. System initialization is simple. Apply power, wait until the automatic gas console (AGC) has finished booting, then transmit the desired material type, material thickness, and process (cutting or marking) and the system will be ready for operation. All other parameters will be set to their default values and may be changed at any time.

Transmitting Parameters to the FineLine System

To transmit parameters to the FineLine, convert the following hex strings to 8 bit binary arrays (AA = 10101010) and transmit them using a 9600 baud RS-422 serial communication port. The port settings should have a start bit, one stop bit, and no parity. A table can be found in this section that lists the RS-422 commands and their descriptions. This table contains the necessary hex strings for sending different commands and parameters to the system. For example, to switch the material type from mild steel to stainless steel, look up the command for setting material type in the table. You will see the following table entry:

Command	#	Hex String	Additional Information
Set Material Type	1	AA nn FA 01 00 -- 0D	00 = Mild Steel – Hot Rolled 01 = Stainless Steel 02 = Aluminum 03 = Other 04 = Mild Steel – Cold Rolled

Note that spaces in the command string are shown for clarity only and should not be sent as part of the command. A command string always begins with the value AA hex. The "nn" is the net node (communication node) of the FineLine system that is to receive the command. The net node value of a system is set via the Set Communication Node selection on the maintenance screen. See Section 5 for detailed information on setting the net node. The value FA hex is the FineLine identifier. The value 01 hex is the value that signifies the Set Material Type command. The value 0D hex is the end of command character. In the above example, the following hex string would need to be transmitted to switch the material type to stainless steel for a FineLine system on node 1:

AA 01 FA 01 00 01 0D

To send a parameter, the parameter value needs to be sent as part of the command. For example, to send a desired pierce delay time of 1000 milliseconds to the system, look up the Set Pierce Delay command in the command table. You will see the following table entry:

Command	#	Hex String	Additional Information
Set Pierce Delay	4	AA nn FA 04 -- -- 0D	Time in mS (seconds / 1000) Valid range: 0 to 5000

Once again, AA hex signifies the start of the command, "nn" is the net node of the power supply, and FA hex is the FineLine identifier. The value 04 hex signifies the Set Pierce Delay command, and 0D hex signifies the end of the command. The "-- --" in the hex string is the MSB followed by the LSB of a type **int**. The integer is the value used in the additional information column. Thus, the "-- --" is sometimes referred to as the additional information value. In the example, we wanted to transmit a pierce delay time of 1000 mS (1 second). This value in hexadecimal would be 03E8 (msb=03, lsb=E8). In this example, the following string would be transmitted in order to set the pierce delay time to 1000mS for a power supply on net node 1:

AA 01 FA 04 03 E8 0D

Communication Error Checking

With a single torch system, all commands and parameters transmitted to the FineLine will be back transmitted in exactly the same form for error checking. With a multiple torch system, global commands will not be back transmitted. Only the system with node focus will back transmit the commands. The purpose of the node focus command (#254) is to allow one FineLine system to use the transmission lines at a time. If no node focus is set on initialization, the first system to receive a command will receive node focus automatically. Commands may be transmitted to systems without node focus, but there will be no back transmission from those systems. Also, all parameters can be read at any time by transmitting a Send Parameter command (#30) to the FineLine, followed by the appropriate parameter to be read.

Default Cutting Parameters

When communicating with the FineLine system, material type, material thickness, and process (cutting or marking) are the only parameters that must be transmitted in order to initialize the unit. All other parameters will be set to their default value. Whenever the material type, material thickness, process, or cutting current is changed, new default values will be retrieved for all other parameters. To use non-standard parameters, first set the material type, material thickness, process, and cutting current, then set the remaining parameters to their desired values.

Troubleshooting Serial Communication

When troubleshooting serial communication with the FineLine system, switch to the View Serial Communication Screen to view incoming and outgoing data. See Section 5 for information on the Serial Communication Screen.

RS-422 Serial Commands

Note: In the following commands, "nn" represents the net node of the power supply that is to receive the command. To send a global command to all power supplies in a network configuration, "nn" should be set to C8 hex (200 decimal). The "-- --" in the hex string is the MSB followed by the LSB of a type **int**. The integer is the value found in the additional information column.

Command	#	Hex String	Additional Information
Set Material Type	1	AA nn FA 01 00 -- 0D	00 = Mild Steel – Hot Rolled 01 = Stainless Steel 02 = Aluminum 03 = Other 04 = Mild Steel – Cold Rolled
Set Thickness	2	AA nn FA 02 -- -- 0D	Thickness in mils (inches x 1000) Valid Range: 0 to 2000
Set Operating Current	3	AA nn FA 03 00 -- 0D	01 = 30 Amps (Cutting) 02 = 50 Amps (Cutting) 03 = 70 Amps (Cutting) 04 = 100 Amps (Cutting) 05 = 150 Amps (Cutting) 06 = 200 Amps (Cutting) 07 = 8 Amps (Marking) 08 = 9 Amps (Marking) 09 = 10 Amps (Marking) 0A = 260 Amps (Cutting) 0B = 275 Amps (Cutting)
Set Pierce Delay	4	AA nn FA 04 -- -- 0D	Pierce Delay Time in ms Valid Range: 0 to 5000
Set Preflow Pressure	6	AA nn FA 06 -- -- 0D	Preflow psi x 10 Valid Range: 0 to 1200
Set Plasma Gas Type	7	AA nn FA 07 00 -- 0D	00 = Oxygen 01 = Nitrogen 02 = Air 04 = H17
Set Plasma Pressure	8	AA nn FA 08 -- -- 0D	Plasma psi x 10 Valid Range: 0 to 1200
Set Shield Gas Type	9	AA nn FA 09 00 -- 0D	00 = Oxygen 01 = Nitrogen 02 = Air 03 = Alternate
Set Shield Pressure	10	AA nn FA 0A -- -- 0D	Shield psi x 10 Valid Range: 0 to 1200

Command	#	Hex String	Additional Information
Torch Height Control Voltage Set Point	11	AA nn FA 0B -- -- 0D	If requested in command #30, the AGC will transmit the recommended arc voltage x 100. Range: 0 to 20000
Torch Height Control Pierce Height	12	AA nn FA 0C -- -- 0D	If requested in command #30, the AGC will transmit the recommended pierce height in mils (inches x 1000). Range: 0 to 999
Torch Height Control Cutting Height	13	AA nn FA 0D -- -- 0D	If requested in command #30, the AGC will transmit the recommended cutting height in mils (inches x 1000). Range: 0 to 999
CNC Machine Travel Speed	15	AA nn FA 0F -- -- 0D	If requested in command #30, the AGC will transmit the recommended travel speed in inches per minute. Range: 0 to 999
Torch Body Part Number (msw)	16	AA nn FA 10 -- -- 0D	If requested in command #30, the AGC will transmit the most significant word of the torch body part number.
Torch Body Part Number (lsw)	17	AA nn FA 11 -- -- 0D	If requested in command #30, the AGC will transmit the least significant word of the torch body part number.
Torch Electrode Part Number (msw)	18	AA nn FA 12 -- -- 0D	If requested in command #30, the AGC will transmit the most significant word of the electrode part number.
Torch Electrode Part Number (lsw)	19	AA nn FA 13 -- -- 0D	If requested in command #30, the AGC will transmit the least significant word of the electrode part number.
Torch Swirl Ring Part Number (msw)	20	AA nn FA 14 -- -- 0D	If requested in command #30, the AGC will transmit the most significant word of the swirl ring part number.
Torch Swirl Ring Part Number (lsw)	21	AA nn FA 15 -- -- 0D	If requested in command #30, the AGC will transmit the least significant word of the swirl ring part number.
Torch Nozzle Part Number (msw)	22	AA nn FA 16 -- -- 0D	If requested in command #30, the AGC will transmit the most significant word of the nozzle part number.
Torch Nozzle Part Number (lsw)	23	AA nn FA 17 -- -- 0D	If requested in command #30, the AGC will transmit the least significant word of the nozzle part number.
Torch Retaining Cap Part Number (msw)	24	AA nn FA 18 -- -- 0D	If requested in command #30, the AGC will transmit the most significant word of the retaining cap part number.

Command	#	Hex String	Additional Information
Torch Retaining Cap Part Number (lsw)	25	AA nn FA 19 -- -- 0D	If requested in command #30, the AGC will transmit the least significant word of the retaining cap part number.
Torch Shield Cap Part Number (msw)	26	AA nn FA 1A -- -- 0D	If requested in command #30, the AGC will transmit the most significant word of the shield cap part number.
Torch Shield Cap Part Number (lsw)	27	AA nn FA 1B -- -- 0D	If requested in command #30, the AGC will transmit the least significant word of the shield cap part number.
Torch Outer Cap Part Number (msw)	28	AA nn FA 1C -- -- 0D	If requested in command #30, the AGC will transmit the most significant word of the outer cap part number.
Torch Outer Cap Part Number (lsw)	29	AA nn FA 1D -- -- 0D	If requested in command #30, the AGC will transmit the least significant word of the outer cap part number.
Send Parameter	30	AA nn FA 1E -- -- 0D	01 = Send material type 02 = Send material thickness 03 = Send current set point 04 = Send pierce delay time 05 = Send preflow gas type 06 = Send preflow pressure 07 = Send plasma gas type 08 = Send plasma gas pressure 09 = Send shield gas type 10 = Send shield gas pressure 11 = Send recommend arc voltage 12 = Send recommended pierce height 13 = Send recommended cutting height 15 = Send recommended travel speed 16 = Send torch body part number msw 17 = Send torch body part number lsw 18 = Send electrode part number msw 19 = Send electrode part number lsw 20 = Send swirl ring part number msw 21 = Send swirl ring part number lsw 22 = Send nozzle part number msw 23 = Send nozzle part number lsw 24 = Send retaining cap part number msw 25 = Send retaining cap part number lsw 26 = Send shield cap part number msw 27 = Send shield cap part number lsw 28 = Send outer cap part number msw 29 = Send outer cap part number lsw 32 = Send process select 33 = Send software version 34 = Send cutting chart version 35 = Send number of pierces 36 = Send number of pierce errors

Command	#	Hex String	Additional Information
Continued from previous page	30		48 = Send cutting condition type 51 = Send arc off delay time 52 = Send machine type
Set Process	32	AA nn FA 20 00 -- 0D	00 = Cutting 01 = Marking
Software Version	33	AA nn FA 21 00 -- 0D	If requested in command #30, the AGC will transmit the software version x 10.
Cutting Chart Version	34	AA nn FA 22 00 -- 0D	If requested in command #30, the AGC will transmit the cutting chart version x 10.
Number of Pierces	35	AA nn FA 23 00 -- 0D	If requested in command #30, the AGC will transmit the number of pierces. Range: 0 to 9999
Number of Pierce Errors	36	AA nn FA 24 00 -- 0D	If requested in command #30, the AGC will transmit the number of pierce errors. Range: 0 to 9999
Reset Pierce Counter	37	AA nn FA 25 00 01 0D	Resets number of pierces and errors to 0
Power On	38	AA nn FA 26 00 01 0D	Energizes power supply, torch coolant pump and cooling fans. If torch coolant flow switch not satisfied within 8 seconds, unit will power down.
Power Off	39	AA nn FA 27 00 01 0D	Deenergizes power supply, torch coolant pump and cooling fans
Request System Status	40	AA nn FA 28 00 01 0D	System status can only be requested after a Power On command (#38) is transmitted. The status is returned in the following form: (All bits: 0=fault; 1=ok) LSB Bit 0 = RHF Door LSB Bit 1 = AC Power LSB Bit 2 = Coolant Flow LSB Bit 3 = Coolant Level LSB Bit 4 = Coolant Temp LSB Bit 5 = AGC status LSB Bit 6 = Inlet Gas Pressures LSB Bit 7 = Gas Hose Change Required MSB Bit 0 = Hydrogen Manifold Installed MSB Bit 1 = Hydrogen Manifold Enabled
Purge Gases	41	AA nn FA 29 00 01 0D	Purges gas lines
Set Arc Voltage	42	AA nn FA 2A -- -- 0D	Arc Voltage in Volts x 100 Valid Range: 5000 to 20000. Also updates the Inova height control, if used.

Command	#	Hex String	Additional Information
Set Cutting Height	43	AA nn FA 2B -- -- 0D	Cutting height in mils (inches / 1000) Valid Range: 0 to 999. Also updates the Inova height control, if used.
Set Pierce Height	44	AA nn FA 2C -- -- 0D	Pierce height in mils (inches / 1000) Valid Range: 0 to 999. Also updates the Inova height control, if used.
Set Travel Speed	45	AA nn FA 2D -- -- 0D	Sets travel speed (inches / min) displayed on the voltage screen in the Cut Parameters window. Valid Range: 0 to 999
Save as User File	46	AA nn FA 2E 00 01 0D	Saves the present cutting conditions as a user file.
Restore Factory Condition	47	AA nn FA 2F 00 01 0D	Restores the factory cutting condition for the present material type and thickness.
Cutting Condition Type	48	AA nn FA 30 00 -- 0D	If requested in command #30, the AGC will transmit whether the present cutting condition is a factory default setting or a custom user setting. Note: This is only valid when initially loading material type, thickness, and process. 0 = factory / 1 = custom
Configure Hydrogen Manifold	49	AA nn FA 31 00 -- 0D	0 = Disable Hydrogen manifold 1 = Enable Hydrogen manifold
Reload Cutting Condition	50	AA nn FA 32 00 01 0D	Reloads the cutting conditions for the present material type and thickness
Set Arc Off Delay Time	51	AA nn FA 33 -- -- 0D	Sets the delay time in mS between the reception of a stop signal and the extinction of the arc. Valid Range: 0 to 2000 mS
Machine Type	52	AA nn FA 34 -- -- 0D	If requested in command #30, the AGC will transmit the machine type and torch body being used: 101 = FineLine 100PC / Torch 500715 102 = FineLine 100PC / Torch 277000 151 = FineLine 150PC / Torch 200000 152 = FineLine 150PC / Torch 277000 201 = FineLine 200PC / Torch 200000 202 = FineLine 200PC / Torch 277000 261 = FineLine 260PC / Torch 200000 262 = FineLine 260PC / Torch 277000
Node Focus	254	AA C8 FA FE 00 nn 0D	Sends a global command to all systems and sets the node focus to system nn

Section 7 Maintenance and Troubleshooting

Warning: Only qualified maintenance personnel should perform maintenance on the FineLine system. The system utilizes potentially fatal A.C. and D.C. voltages. All maintenance should be performed with safety in mind. Be aware that the large blue electrolytic capacitors inside the power supply store large amounts of energy even after power has been removed from the system. Wait at least five minutes after turning off power before touching any of the internal components.

Routine Maintenance

Note: At minimum, these checks should be performed on a monthly basis. In excessively dirty environments or in heavy usage situations, the checks should be performed more frequently.

Power Supply

1. Remove the left, right, front, and rear panels of the power supply.
2. Using clean, dry, compressed air, blow out all accumulated dust inside the power supply, including dust on p.c. boards and fans. Be sure to blow out the fan and heat exchanger at the rear of the unit. In an excessively dirty environment, blow out the unit on a weekly basis.
3. Verify that all torch lead and work ground connections are secure and free from corrosion.
4. Verify that the primary three phase A.C. voltage connections are tight
5. Verify that all p.c. board connectors are installed securely.
6. Verify that the rear panel cable connectors are installed securely.
7. Verify that the automatic gas console connector is installed securely to the plug on the bottom of the gas console.
8. Check the torch coolant filter/deionization cartridge at the rear of the power supply and replace if dirty.
9. Flush the cooling system every six months and replace the coolant and coolant filter/deionization cartridge.

Automatic Gas Console

1. Remove the cover of the automatic gas console.
2. Using clean, dry, compressed air, blow out all accumulated dust inside the unit. In an excessively dirty environment, blow out the unit on a weekly basis.
3. Verify that all p.c. board connectors are installed securely.
4. Verify that all gas hose connectors are tight and that there are no leaks. **Only tighten the gas fittings enough to make a gas seal. The fittings are subject to damage if over tightened**.

Torch, Torch Leads, and Gas Hoses

1. Verify that all torch lead and gas hose connections are tight and that there are no gas or water leaks. **Only tighten the fittings enough to make a water or gas seal. The fittings are subject to damage if over tightened**.
2. Verify that the braided shield of the torch leads is fastened securely to the brass shield adapter that connects to the remote high frequency console. Also, make sure the shield adapter is secured tightly to the high frequency console enclosure.
3. Inspect the braided shield for nicks or cuts and replace if necessary.
4. Remove the torch handle and verify that the connections at the rear of the torch are tightened securely. **Only tighten the fittings enough to make a water or gas seal. The fittings are subject to damage if over tightened**. Also, make sure the torch lead insulating sleeves are positioned to properly cover the brass torch fittings at the rear of the torch.
4. Remove the torch consumables from the torch and inspect the o-rings on the torch body. Replace any o-rings with cuts, nicks, abrasions, or any other signs of wear. Faulty o-rings may cause gas or water leaks, which will affect cut quality.
5. Wipe any excess o-ring lubricant off of the torch body.

Remote High Frequency Console

1. Open the cover of the RHF console and verify that all leads and hoses are tightened securely. **Only tighten the fittings enough to make a water or gas seal. The fittings are subject to damage if over tightened**.
2. Check the spark gap electrodes for signs of wear. Replace electrodes that have rounded faces. Use a clean feeler gauge and set the spark gap to .025" (.64 mm).

Work Ground

1. Verify that the work ground lead is securely fastened to the star ground on the cutting table, and that the connection point is free from corrosion. Use a wire brush to clean the connection point if necessary.

Replacing the Torch Coolant

The torch coolant should be flushed out of the system every six months and replaced with new coolant. The following procedure should be used to prevent damage to the cooling system.

1. Remove primary power to the system.

2. Remove the rear cover of the power supply to expose the cooling system.

3. Remove the coolant reservoir cap/level gauge.

4. Make sure that consumables are properly installed in the torch.

5. **Using a funnel to collect the coolant,** unscrew the drain petcock on the bottom of the coolant reservoir. Leave the funnel in place after the coolant drains out of the reservoir.

6. Remove the torch coolant supply hose from the rear of the power supply. Note that the coolant supply hose has right hand threads.

7. Blow compressed air (100 psi maximum) into the coolant supply hose. This will clear the coolant out of the torch, torch leads, and heat exchanger. Note that the coolant will be forced into the reservoir and will drain out of the drain petcock.

8. Unscrew the lower portion of the coolant filter housing and remove the coolant filter/deionization cartridge.

9. Reconnect the coolant hoses and replace the coolant and coolant filter/deionization cartridge. **Only use the recommended FineLine torch coolant solution**. Commercially available antifreeze contains corrosion inhibitors that will damage the cooling system. See Section 3 for more information on torch coolant requirements.

Microprocessor Status LED's

The microprocessor p.c. board controls all of the functions of the FineLine system. It has 31 LED's which aid in troubleshooting the system. The LED's illuminate when a particular event occurs. Illuminated LED's indicate the following:

LED	Indication
LED 1 PAR	Pilot arc relay energized
LED 2 CON	Main contactor energized
LED 3 SURGE	CR3 and K1 (I/O p.c. board) relays energized
LED 4 PREFLOW	Preflow gas valve 1 energized
LED 5 LATCH	Latch relay on the relay p.c. board energized
LED 6 SHIELD	Not used
LED 7 PUMP	Coolant pump relay CR5 energized
LED 8 START	Plasma start signal applied to FineLine
LED 9 CHOPPER	Chopper energized
LED 10 PAT	Pilot arc transistor energized
LED 11 TAC	Transferred arc established from torch to workpiece
LED 12 MOTION	Motion relay energized
LED 13 HOLD IN	Arc hold input or IHS hold input enabled to keep arc from igniting
LED 14 HOLD OUT	Hold relay energized / used for dual power supply mode
LED 15 MAN CONSOLE	Not used
LED 16 5V uP PWR	5V microprocessor power supply satisfactory
LED 17 12V uP PWR	12V microprocessor power supply satisfactory
LED 18 ILK PWR	12V interlock power supply satisfactory
LED 19 ANALOG PWR	15V analog power satisfactory
LED 20 GAS PWR	24V gas solenoid power satisfactory
LED 21 OVER CURRENT	Current output exceeded 200 amps / power down to reset
LED 22 ERROR	Blinks on and off to display error codes
LED 23 GSV4	Postflow gas valve 4 energized
LED 24 PLASMA	Plasma gas valve 2 energized
LED 25 AUX OUT	Auxiliary output energized
LED 26 3 PHASE	Correct three phase power applied to chopper
LED 27 HIGH FREQ	High frequency transformer TR5 energized
LED 28 COMM PWR	5V communication power supply satisfactory
LED 29 –15V	-15V analog power satisfactory
LED 30 XMIT	Blinks to show serial transmission to automatic gas console
LED 31 RECV	Blinks to show serial transmission from automatic gas console

Microprocessor Sequence of Operation

The following LED's should illuminate after primary power is applied:

- LED 16 5V uP PWR
- LED 17 12V uP PWR
- LED 18 ILK PWR
- LED 19 ANALOG PWR
- LED 20 GAS PWR
- LED 28 COMM PWR
- LED 29 –15V

The following LED's should illuminate when the ON button is depressed:

- LED 26 3 PHASE
- LED 7 PUMP
- LED 5 LATCH

The following LED's should illuminate in sequence after a start signal is received:

- LED 8 START
- LED 4 PREFLOW
- LED 14 HOLD OUT
- LED 2 CON
- LED 9 CHOPPER
- LED 1 PAR
- LED 10 PAT
- LED 27 HIGH FREQ
- LED 11 TAC
- LED 24 PLASMA
- LED 12 MOTION

After a transferred cutting arc is established, the following LED's will go out:

- LED 14 HOLD OUT
- LED 27 HIGH FREQ
- LED 4 PREFLOW
- LED 1 PAR
- LED 10 PAT

When the start signal is removed, LED 23 GSV4 will illuminate briefly and then go out with the rest of the cut cycle LED's.

Troubleshooting Using the Control Panel Status LED's

If the FineLine system develops a problem, first check the control panel status LED's. If one or more of the LED's does not illuminate after the ON button is depressed, use the status LED's to pinpoint the problem.

- **RHF Door LED** - Extinguishes when the RHF door switch opens. Check the RHF door, switch, and associated wiring.
- **Gas Console LED** - Extinguishes when there is a problem with the gas console or when the unit is adjusting gas pressures. Switch to the messages screen on the gas console to pinpoint the problem.
- **3 Phase Power LED** - Extinguishes when there is a problem with the three phase power being supplied to the chopper assembly. Verify that the primary wall disconnect fuses are good and check the main transformer, main contactor and A.C. Detect p.c. board for proper operation.
- **Coolant Flow LED** - Extinguishes when there is a problem with the torch coolant system. Check the coolant pump fuse F2 and verify that 230VAC is present between TB3-13 and TB3-14. Also check for clogs in the coolant leads and coolant filter/deionization cartridge.
- **Coolant Level LED** - Extinguishes when the coolant level in the tank has dropped below the required minimum level. Add more coolant to clear the error.
- **Coolant Temperature LED** - Extinguishes when the coolant temperature has risen above the maximum operating temperature. Ensure that the heat exchanger fan is running and that the heat exchanger is free from dust. Blow out the heat exchanger and fan with clean, dry, oil-free compressed air. Leave the unit running until the LED illuminates.

Troubleshooting Using the Automatic Gas Console Messages Screen

If all of the status LED's are illuminated but the FineLine system still has a problem, switch to the messages screen on the automatic gas console (see Section 5 for specific instructions on switching to the messages mode). The gas console may display information that is useful in pinpointing the problem. While the automatic gas console is displaying an error message, the power supply microprocessor displays an error code by blinking LED22 on and off to indicate that an error has occurred. The number of blinks can be counted to determine which error has occurred. The following chart lists the errors and the corresponding number of blinks.

LED22 Number of Blinks	Error
1	No transferred arc (TAC) established
2	TAC lost before current slope up
3	TAC lost during current slope up
4	TAC lost while cutting
5	TAC lost during current slope down
6	Start signal applied prematurely
7	Start signal removed prematurely
8	Output voltage below 60V
9	Output voltage above 210V
10	Invalid current set point
11	Current feedback circuit open
12	TAC not established within 2 seconds
13	IHS or arc hold timed out
14	Pilot arc not established
15	Low current during cut
16	TAC sensed when start signal applied
17	Faulty AC phase
18	Low torch coolant flow
19	Gas console error
20	RHF door switch open
21	Low torch coolant level
22	High torch coolant temperature
23	Main contactor shorted

General Troubleshooting

The following chart lists general troubleshooting guidelines for the FineLine system when the status LED's or the automatic gas console messages screen do not give any insight to the particular problem being experienced. Please contact KALIBURN technical support for any issues not covered in this section. Before any tests are performed, make sure that all system fuses are good. The primary system fuse F1 is located on the rear panel of the unit. All of the control fuses are located behind the front panel of the unit beside the microprocessor p.c. board. The automatic gas console fuse is located behind the right side panel of the system. Also check all of the voltage LED's on the system p.c. boards before performing any tests.

Problem	Possible Cause
Front panel white A.C. power light will not illuminate	1. Primary disconnect fuse blown. 2. Fuse F1 or F4 blown. 3. White light or associated wiring bad. 4. Transformer TR2 or associated wiring bad.
Unit will not energize when the ON button is pressed	1. RHF door open. 2. Low coolant level. 3. Fuse F4 blown. 4. Faulty ON switch or associated wiring. The ON switch is normally open. 5. Faulty OFF switch or associated wiring. The OFF switch is normally closed. 6. Relay CR1 coil open.
Power supply will not stay on when the front panel ON button is pressed and released	1. Check the control panel status LED's and troubleshoot accordingly. 2. Check the gas console messages screen and troubleshoot accordingly. 3. Faulty latch relay on relay p.c. board. 4. Faulty relay p.c. board. 5. Faulty microprocessor p.c. board. 6. Relay CR1 defective.
No arc at the torch	1. Incorrect torch consumables installed. 2. Incorrect gas pressure settings. 3. Check the control panel status LED's and troubleshoot accordingly. 4. Check the spark gap assembly inside the RHF console for proper arcing after a start signal is applied. Open the RHF door and pull up on the door interlock switch plunger to defeat the interlock. If there is no spark, skip to the next test. 5. Check the automatic gas console messages screen and troubleshoot accordingly. If the "output voltage low" error is present, perform the chopper test in this section. 6. Pilot arc resistor PAR or pilot arc transistor

	PAT is not closing properly. Check the relay for proper operation. Also, check the PAR and PAT LED's on the microprocessor p.c. board and PAT drive p.c. board. 7. Damaged or loose torch lead connections. 8. Shorted torch or torch leads. Check the continuity between the Electrode lead and the Nozzle lead to make sure they are not shorted. 9. Open torch or torch leads. Check the continuity from the Electrode lead to the torch electrode and the Nozzle lead to the large brass body of the torch.
No spark between the spark gap electrodes	1. Improper spark gap. Set gap to .025" (.635 mm). 2. Worn spark gap electrodes. Clean electrodes with fine sandpaper and regap. Replace electrodes that have a rounded face. 3. Bad high frequency transformer TR5. Check for signs of arcing. 4. Check for 120VAC on the input side of filter FL1 inside the RHF console after a start signal has been given. If 120V is not present, check associated wiring back to the power supply.
The arc will not transfer to the workpiece	1. Loose work ground connection. 2. Pierce height too high. 3. Incorrect, damaged, or worn consumables.
The gas console screen is blank	1. Blown gas console fuse F10. 2. Loose cables inside the gas console. Remove and reinstall all plugs on the interface p.c. board, computer, video board, and display. 3. Bad power supply inside gas console. Check for all voltage LED's on the interface board and computer. 4. Loose plug P17 on the bottom of the gas console. Remove and reinstall the plug.
No response from the gas console keypad	1. Loose keypad cable inside the gas console. Remove and reinstall the keypad cable.
Gas pressures will not adjust properly	1. Wrong consumables installed in torch. 2. Loose pressure transducer cable. Remove and reinstall P7 on the gas console I/O p.c. board. 3. Loose motorized regulator plugs. Remove and reinstall the motor plugs and P3-P6 on the gas console I/O p.c. board. 4. Pressure regulator orifice clogged with dirt or debris. Turn off primary power and turn motorized regulator screw all the way in by hand. 5. Binding regulator. Turn off primary power and turn all motorized regulators to their mid positions by hand.

Low pressure error	1. Supply gas pressure(s) less than 150 psi. 2. Faulty pressure switch or associated wiring inside gas console.
Pressure error during cut	1. Supply gas pressure(s) fluctuating during cut.

Chopper Test Procedure

Warning: Only qualified maintenance personnel should perform the chopper test procedure. The system utilizes potentially fatal A.C. and D.C. voltages. All maintenance should be performed with safety in mind. Be aware that the large blue electrolytic capacitors on the chopper assembly store large amounts of energy even after power has been removed from the system. Wait at least five minutes after turning off power, and then use a voltmeter to verify that the capacitors are fully discharged before touching the chopper.

Note: A chopper troubleshooting flow chart can be found at the end of this section.

1. Turn off all power to the FineLine power supply.

2. Open the RHF console door and disconnect the black primary wires of the high frequency transformer from the 120 VAC line filter. Close the RHF console door to activate the door interlock switch.
3. Remove the front and left side panels from the power supply to expose the output terminal block and the microprocessor p.c. board.

4. Remove the Electrode and Nozzle leads from the **bottom** connections of the output terminal block (refer to Figure 3-3).

5. Apply three phase power to the unit and check the primary power on the input terminal block TB5 (refer to Figure 3-2).

6. Depress the ON button to energize the FineLine system, and then apply a start signal to the unit. **Note that the unit will only energize for approximately two seconds each time a start signal is applied. When making the following readings, be sure the red DC Power light is illuminated on the front control panel of the unit**. After applying the start signal, check the three phase voltage input to the chopper at the diode bridge terminals (three right side screws on the chopper assembly) for 225 VAC. If the voltage is not present, check for primary voltage on the main contactor CON and on the primary side of the power transformer.

7. With a start signal applied, check for 325 VDC at the FineLine output terminal block between Electrode and Work. If 325 V is present, the

chopper is working properly.

8. If 325 VDC is not present at the output terminal block, check the chopper status LED's when a start signal is applied:
   a) LED's 1 through 5 off - go to step 9.
   b) LED's 1 through 5 on, LED 6 off - go to step 10.
   c) LED's 1 through 5 on, LED 6 on, LED 7 off - go to step 11.
   d) Only some of LED's 1 through 5 on - replace chopper.

9. Check the 120 VAC supply to the chopper between P1-1 and P1-2 on the chopper p.c. board. If 120 V is present, replace the chopper. If 120 V is not present, check fuse F2 and associated wiring.

10. Apply a start signal to the power supply and heck the DC voltage between P2-4 (ground) and P2-5 (signal) on the chopper p.c. board. This voltage should change from approximately 4.0 VDC to less than 1 VDC after the main contactor of the power supply is energized. If 4 VDC is not present, replace the chopper. If no voltage change occurs, check for approximately 4.0 VDC between P26-1 (ground) and P26-2 (signal) on the microprocessor p.c. board. If 4.0 VDC is not present, check continuity between P26 on the microprocessor p.c. board and P2 on the chopper p.c. board. If 4.0 VDC is present at the microprocessor p.c. board, replace the microprocessor.

11. **Turn off primary power to the power supply**. Disconnect P2 from the chopper p.c. board and P26 from the microprocessor p.c. board. Check continuity between P26-8 and P2-1 and between P26-7 and P2-2. Also check that these wires are not shorted to each other. If the cable is OK, connect P26 to the microprocessor p.c. board, but leave P2 disconnected from the chopper. With power applied, give the power supply a start signal and check for approximately 10 VDC between P26-7 (ground) and P26-8 (signal) when the main contactor is energized. If 10 VDC is not present, replace the microprocessor p.c. board. If 10 VDC is present, turn all power off, reconnect P2 to the chopper p.c. board, and repeat the test for 10 VDC between P2-2 (ground) and P2-1 (signal). If 10 VDC is present and LED 7 is not illuminated, replace the chopper.

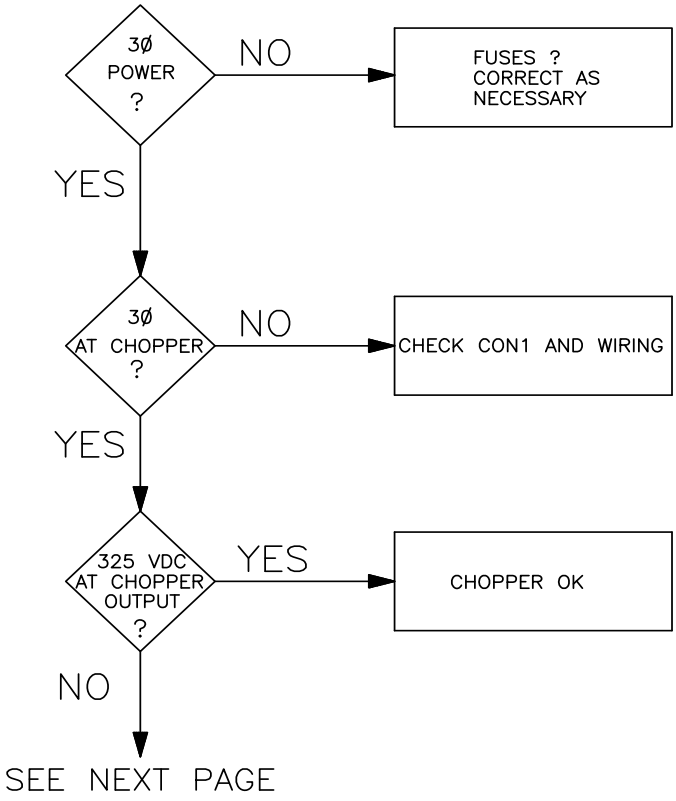


Figure 7-1 Chopper Diagnostics - Part 1

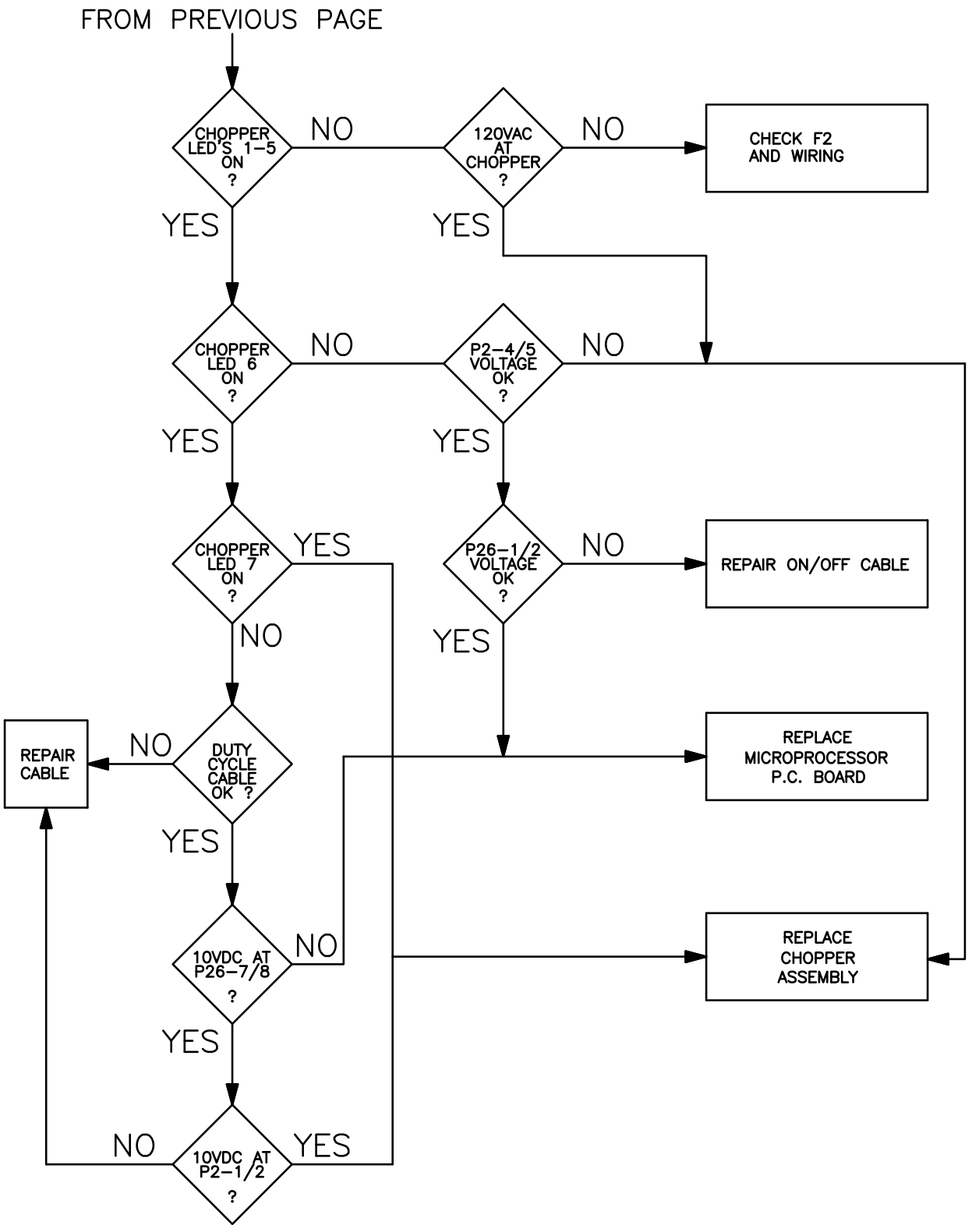


Figure 7-2 Chopper Diagnostics - Part 2

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Section 8 Parts List

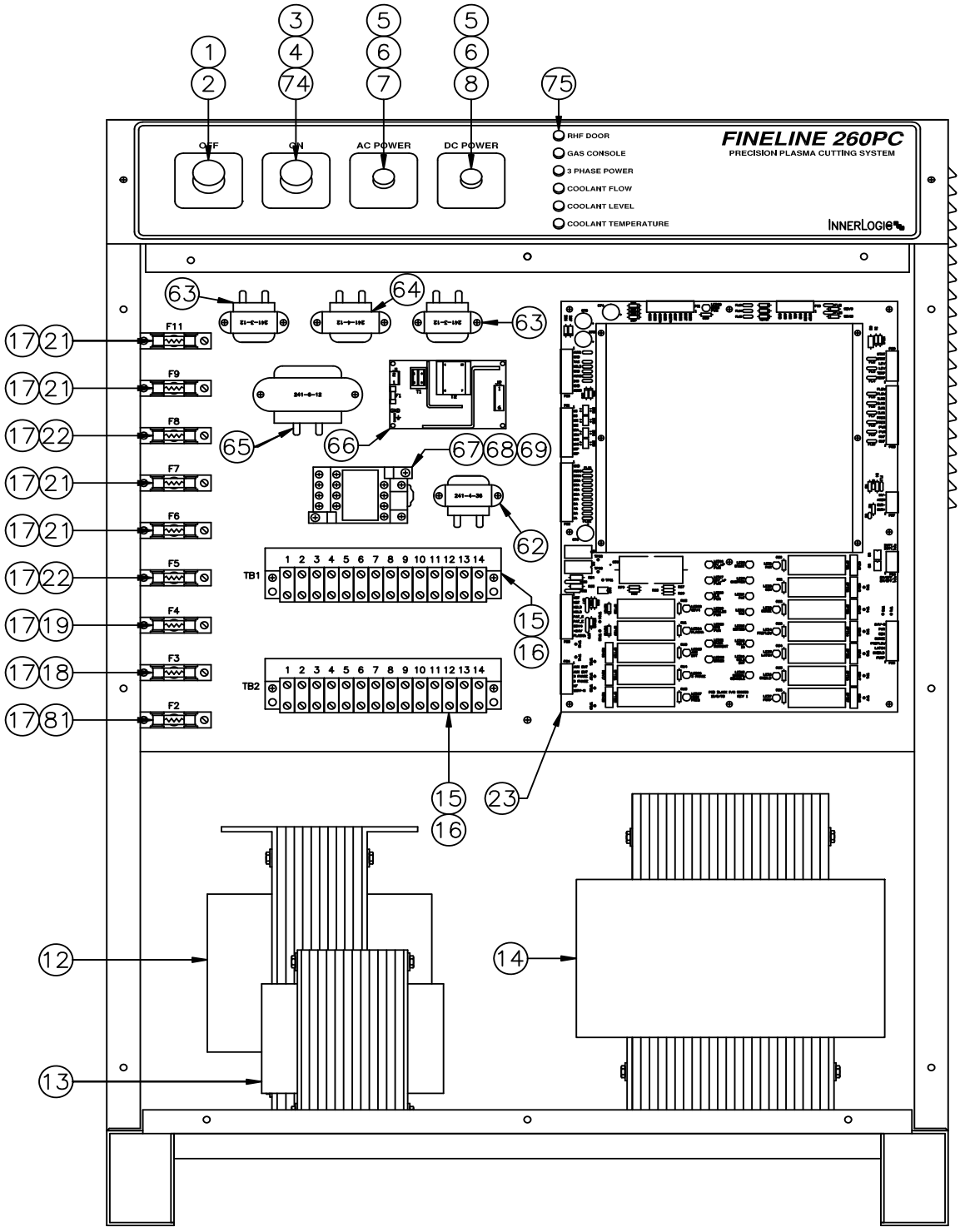
Power Supply

Note: See Figures 8-1 to 8-4.

Item Number	Part Number	Quantity	Description
1	708088	1	Off switch, red
2	708111	1	Off actuator, red
3	708090	1	On switch, green
4	708089	1	On actuator, green / illuminated
5	501163	2	Light housing
6	501164	2	Bulb
7	501162	1	White lens
8	501161	1	Red lens
12	707260	1	L1 inductor
13	500557	1	TR2 control transformer, 208/230/460 V / 60 Hz
	706205		TR2 control transformer, 575 V / 60 Hz
	500559		TR2 control transformer, 380/415 V / 50 Hz
14	706261	1	TR1 main transformer, 230 V / 60 Hz / 3Ø
	706262		TR1 main transformer, 380 V / 50 Hz / 3Ø
	706263		TR1 main transformer, 415 V / 50 Hz / 3Ø
	706260		TR1 main transformer, 460 V / 60 Hz / 3Ø
	706264		TR1 main transformer, 575 V / 60 Hz / 3Ø
15	709086	4	TB1 – TB4 terminal block marker strip, 14 position
16	709007	4	TB1 – TB4 terminal block, 14 position
17	709058	10	F2-F11 fuse holder
18	709012	1	F10 fuse, AGC 3A fuse
19	709011	2	F3/F4 fuse, AGC 5A
21	709076	4	F6/F7/F9/F11 fuse, AGC 1/2A
22	709033	2	F5/F8 fuse, AGC 1A
23	261450	1	Microprocessor p.c. board assembly
24	709002	3	P8/P12/P13, 14 socket receptacle
25	709001	1	P7, 4 pin receptacle
26	709124	1	P16, 9 socket receptacle
27	709061	2	F1A/F1B fuse holder
28	709128	2	F1A/F1B fuse, FNM 6.25A
29	709060	1	Strain relief
30	500810	1	A.C. detect p.c. board assembly
31	200092	1	Coolant reservoir, without fittings or cap
Not shown	200292	1	Coolant reservoir assembly, with fittings and cap
32	500518	1	Coolant reservoir cap/level gauge
33	708062	1	LS1 coolant level switch
34	505024	1	TS1 Coolant temperature switch
35	500052	1	Pump motor, 1/3hp-230V-50/60 Hz
36	500513	1	V-band clamp

Item Number	Part Number	Quantity	Description
37	500511	1	Coolant pump, 70 gph
38	708061	1	Solenoid valve, 220/240VAC
39	715084	1	Check valve, coolant return
40	708068	1	CON3 coolant pump relay
41	708059	1	FS1 coolant flow switch
42	500516	1	Fan, front panel
43	260250	1	Heat exchanger
44	260012	1	Shunt
45	500509	1	Coolant filter housing
46	500510	1	Coolant filter/deionization cartridge
47	708110	1	CON main contactor
48	500348	1	Relay p.c. board assembly
49	702076	1	EMI filter, 380/415 V units only
50	708011	2	PAR/CR2 relay
51	701165	2	R7/R8, 3 ohm pilot arc resistor
52	500536	1	PAT IGBT drive p.c. board assembly
53	705011	1	PAT IGBT
54	709167	1	TB5 3Ø power terminal block
55	702054	1	PAT IGBT filter capacitor
56	277452	1	I/O p.c. board assembly
57	Contact factory	1	Height control voltage divider p.c. board assembly
58	260008	1	Chopper assembly
59	709117	1	I/O terminal block (small)
61	708106	7	Relay, DPDT
62	706036	1	TR8 transformer, 241-4-36
63	706041	2	TR4/TR7 transformer, 241-3-12
64	706042	1	TR5 transformer, 241-4-12
65	706043	1	TR3 transformer, 241-6-12
66	280003	1	Power supply, 24VDC
67	708103	1	CR1 relay
68	708104	1	CR1 relay socket
69	708105	1	CR1 hold-down clip
72	709190	1	TB6 terminal block marker strip, 4 position
73	709191	1	TB6 terminal block, 4 position
74	740106	1	Bulb, power on switch
75	704050	6	LED/lens, green
76	200204	3	Fan, 120V
77	715052	1	Drain petcock
78	500526	2	Fan guard (large) – outside
	500574	2	Fan guard (small) - inside
79	709228	1	I/O terminal block (large)
80	709227	2	Strain relief
81	709231	1	F2 fuse, MDL 5A
82	500525	4	Fan, heat exchanger / front panel

Item Number	Part Number	Quantity	Description
83	701141	1	R9, 2 ohm pilot arc resistor



Front panel fans not shown (item numbers 42 and 82)

Figure 8-1 Power Supply Front View

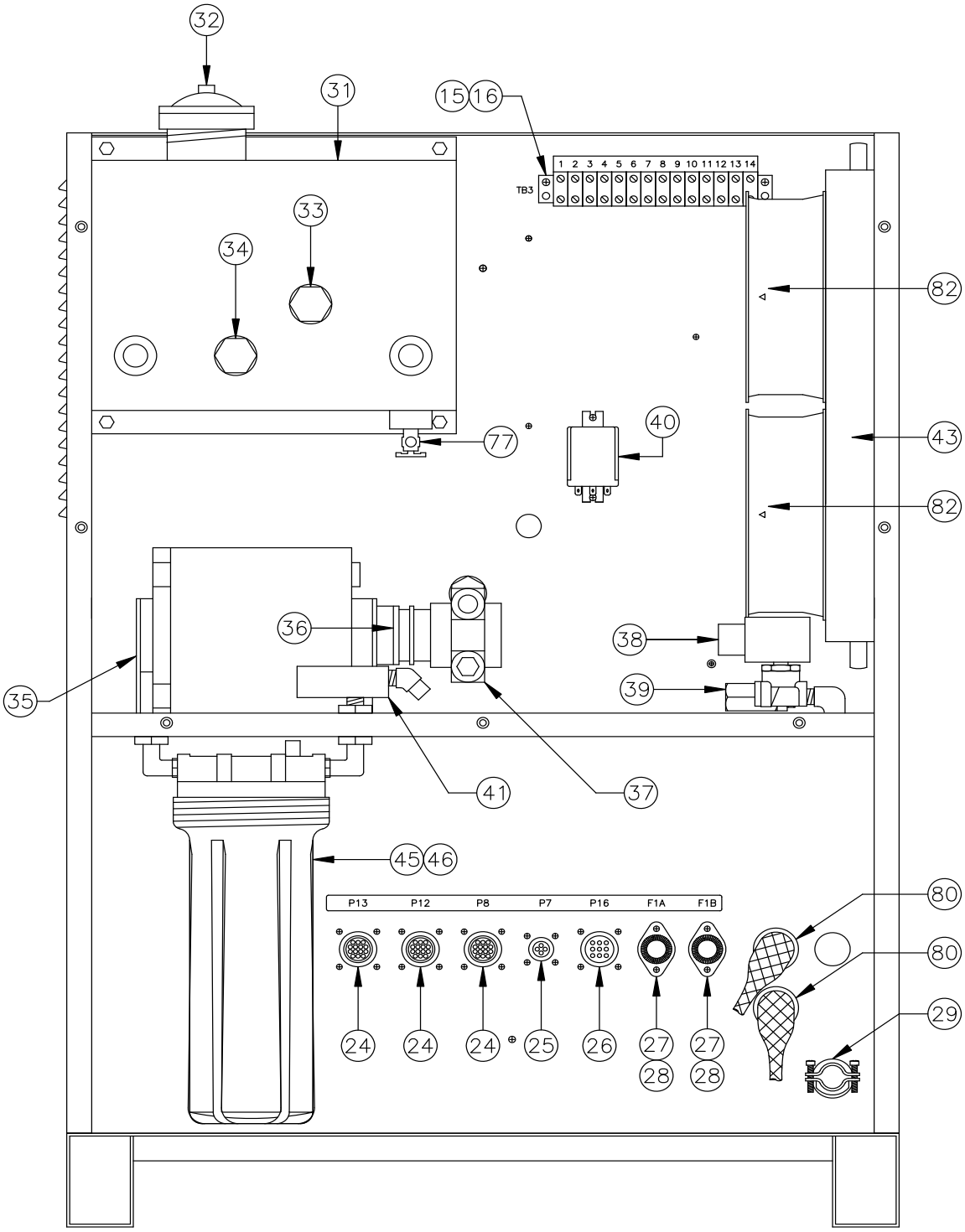


Figure 8-2 Power Supply Rear View

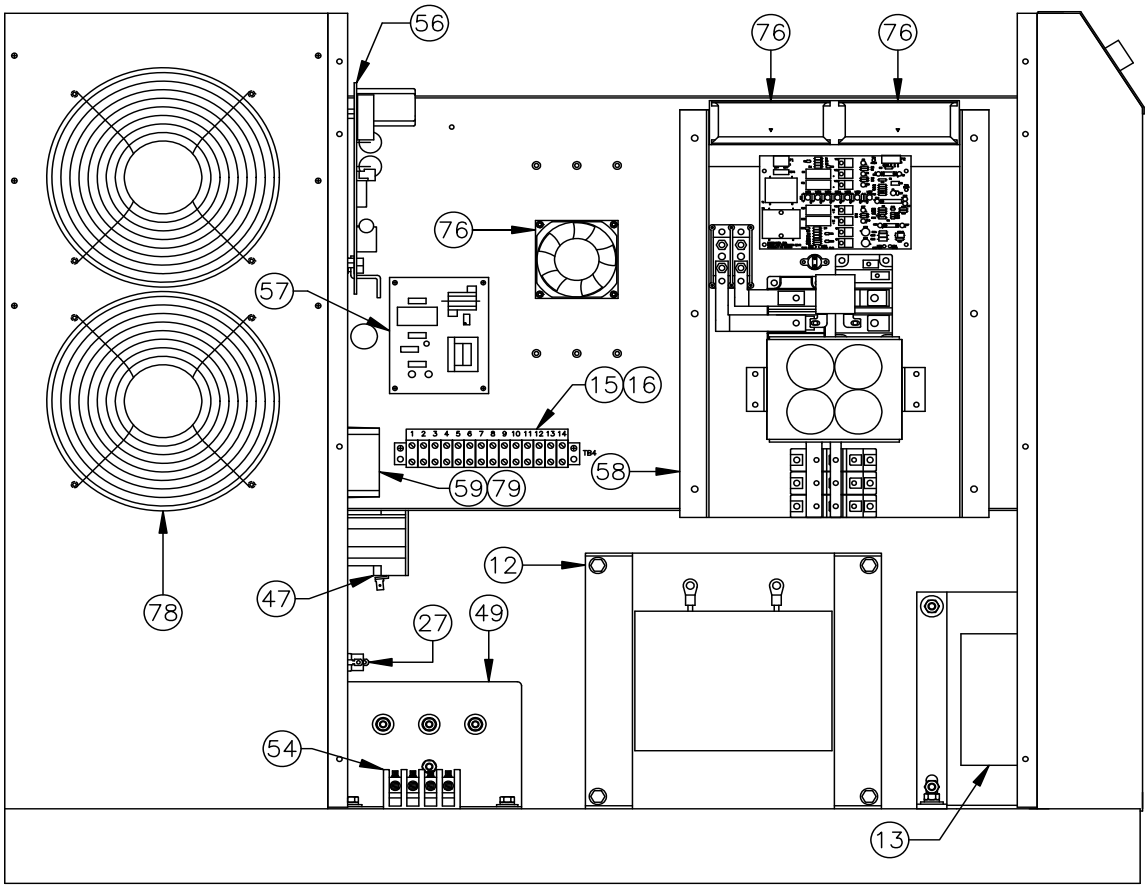


Figure 8-3 Power Supply Left Side View

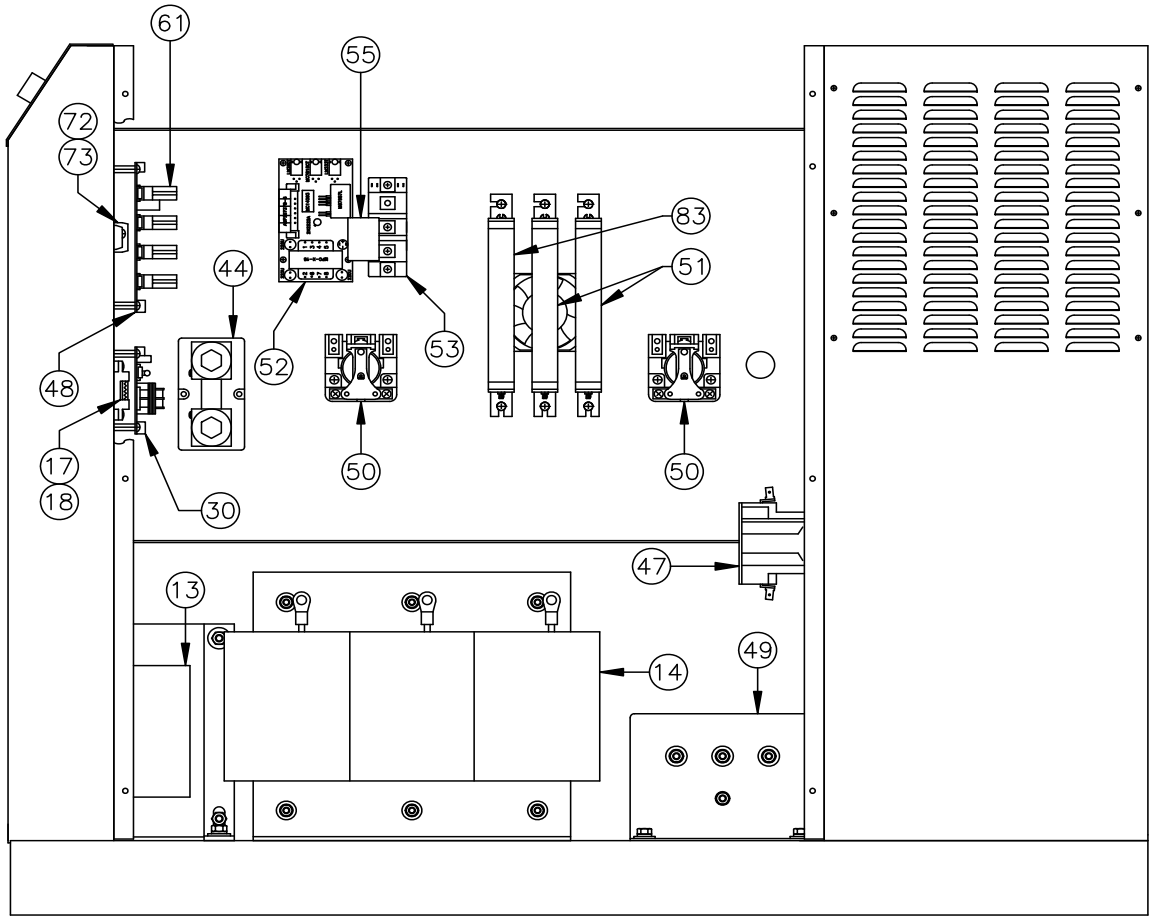


Figure 8-4 Power Supply Right Side View

Remote High Frequency Console

Note: See Figure 8-5.

Item Number	Part Number	Quantity	Description
1	715051	2	Coolant return fitting (left hand)
2	715050	1	Coolant supply fitting (right hand)
3	709227	1	Strain relief
4	710147	1	Lock nut
5	709001	1	4 pin receptacle
6	707001	1	Line filter
7	706019	1	Transformer – 5000V, 20 mA
8	702069	1	Capacitor – 15 kV
9	708057	1	Door interlock switch
10	500014	1	Spark gap assembly
11	740039	3	Spark gap electrode
12	505043	1	High frequency inductor
13	740072	1	Standoff
14	800041	1	Busbar
15	500505	1	RHF console p.c. board assembly
16	715021	1	Coolant supply fitting (right hand)
17	500503	1	Cathode manifold
18	205010	1	CTP sensor lead filter assembly
19	200287	1	Transformer insulating plate
22	500098	1	Ground cable

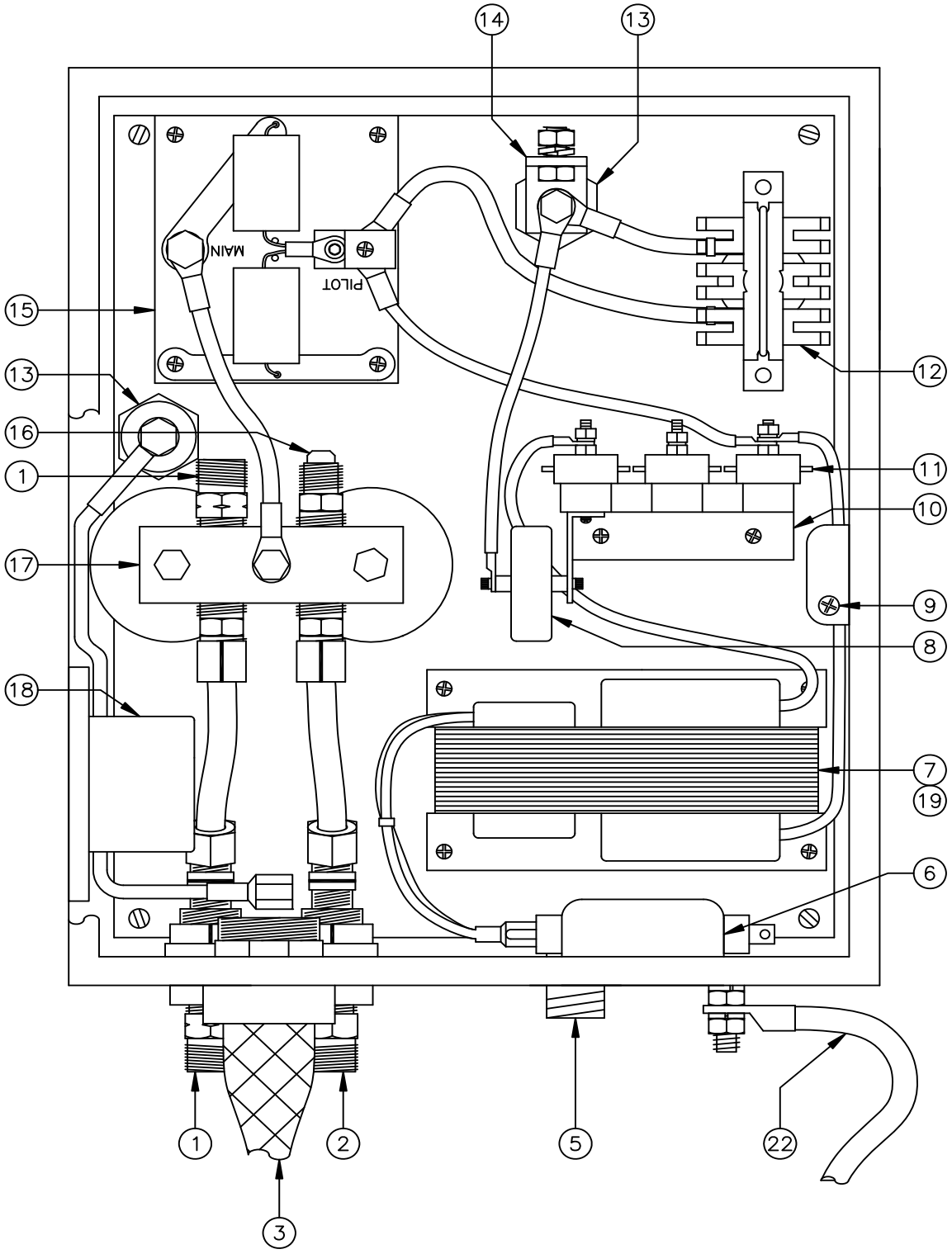


Figure 8-5 Remote High Frequency Console

Torch and Torch Valve Assembly

Item Number	Part Number	Quantity	Description
1	277475	1	Torch valve assembly (includes bracket)
2	500549	1	Torch valve bracket
3	820134	1	Torch handle
4	277000	1	Torch main body
5	500740	1	Torch solenoid plasma hose
6	820209	1	O-ring
7	500024	1	O-ring
8	500018	1	O-ring
Not shown	716008	1	O-ring lubricant
Not shown	277056	1	Consumable removal tool
Not shown	277086	1	Electrode removal tool driver
Not shown	277087	1	Electrode removal tool socket

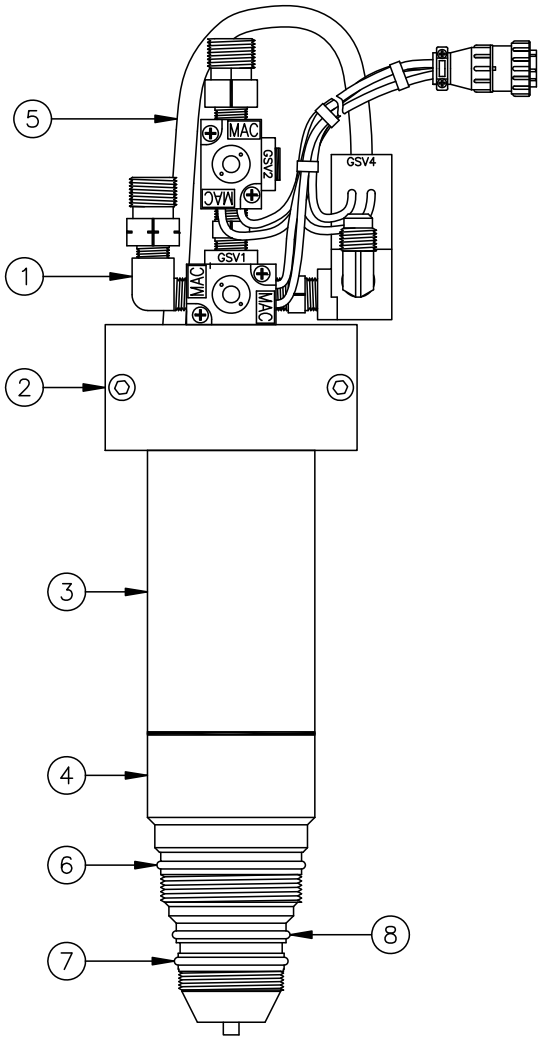


Figure 8-6 Torch and Torch Valve Assembly

Shielded Torch Leads

Part Number	Length
261150-10	10 ft. (3.0 m)
261150-15	15 ft. (4.6 m)
261150-20	20 ft. (6.1 m)
261150-25	25 ft. (7.6 m)
261150-30	30 ft. (9.1 m)
261150-35	35 ft. (10.7 m)
261150-40	40 ft. (12.2 m)
261150-45	45 ft. (13.7 m)
261150-50	50 ft. (15.2 m)

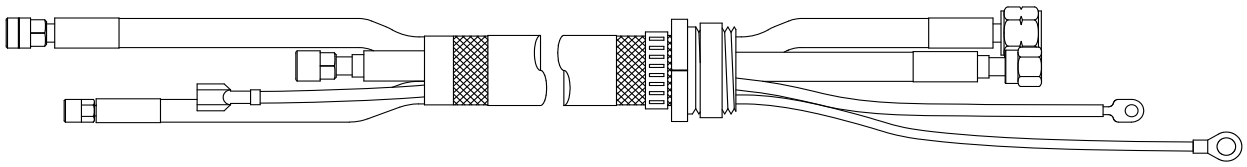


Figure 8-7 Shielded Torch Leads

Gas Hose Package

Part Number	Length
200317-20	20 ft. (6.1 m)
200317-25	25 ft. (7.6 m)
200317-30	30 ft. (9.1 m)
200317-35	35 ft. (10.7 m)
200317-40	40 ft. (12.2 m)
200317-45	45 ft. (13.7 m)
200317-50	50 ft. (15.2 m)
200317-55	55 ft. (16.8 m)
200317-60	60 ft. (18.3 m)
200317-65	65 ft. (19.8 m)
200317-70	70 ft. (21.3 m)
200317-75	75 ft. (22.9 m)
200317-80	80 ft. (24.4 m)
200317-85	85 ft. (25.9 m)
200317-90	90 ft. (27.4 m)
200317-95	95 ft. (29.0 m)
200317-100	100 ft. (30.5 m)

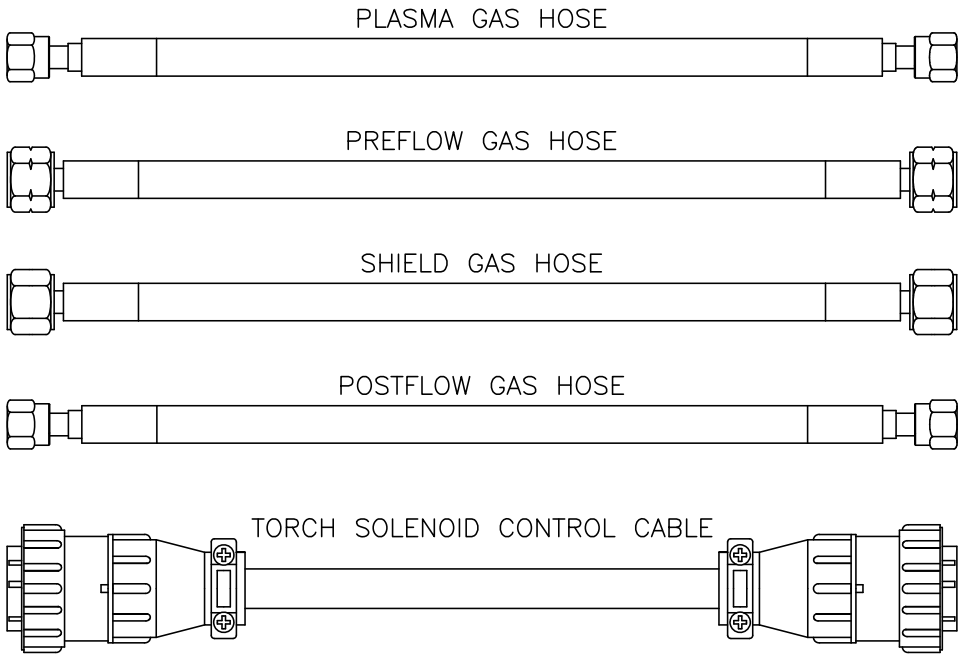


Figure 8-8 Gas Hose Package

Coolant and Power Leads

Part Number	Length
200306-5	5 ft. (1.5 m)
200306-10	10 ft. (3.0 m)
200306-15	15 ft. (4.6 m)
200306-20	20 ft. (6.1 m)
200306-25	25 ft. (7.6 m)
200306-30	30 ft. (9.1 m)
200306-35	35 ft. (10.7 m)
200306-40	40 ft. (12.2 m)
200306-45	45 ft. (13.7 m)
200306-50	50 ft. (15.2 m)
200306-55	55 ft. (16.8 m)
200306-60	60 ft. (18.3 m)
200306-65	65 ft. (19.8 m)
200306-70	70 ft. (21.3 m)
200306-75	75 ft. (22.9 m)
200306-80	80 ft. (24.4 m)
200306-85	85 ft. (25.9 m)
200306-90	90 ft. (27.4 m)
200306-95	95 ft. (29.0 m)
200306-100	100 ft. (30.5 m)

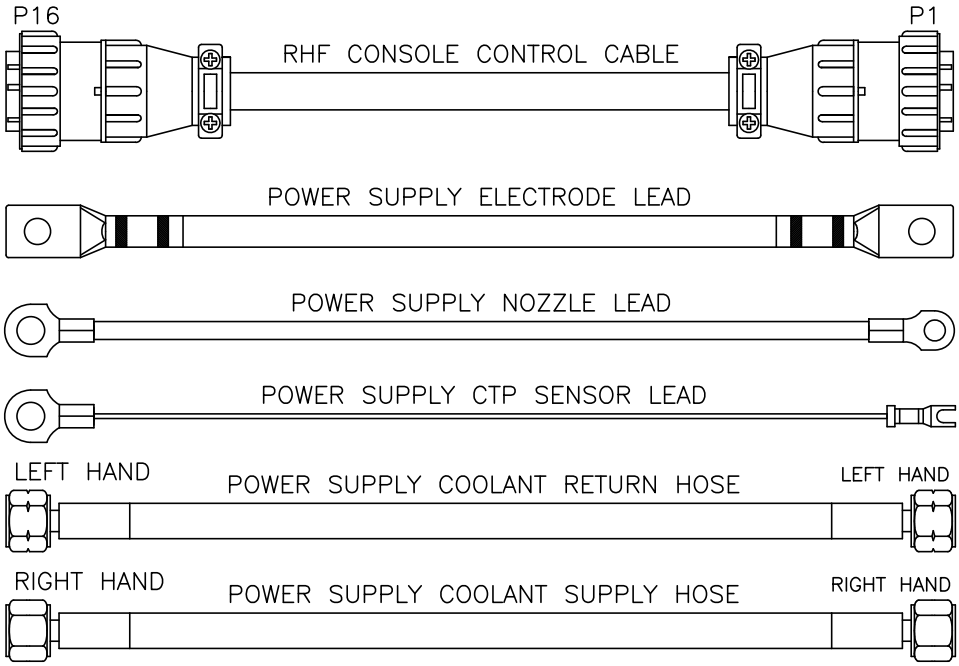


Figure 8-9 Coolant and Power Leads

Work Ground Cable

Part Number	Length
200318-10	10 ft. (3.0 m)
200318-15	15 ft. (4.6 m)
200318-20	20 ft. (6.1 m)
200318-25	25 ft. (7.6 m)
200318-30	30 ft. (9.1 m)
200318-35	35 ft. (10.7 m)
200318-40	40 ft. (12.2 m)
200318-45	45 ft. (13.7 m)
200318-50	50 ft. (15.2 m)
200318-55	55 ft. (16.8 m)
200318-60	60 ft. (18.3 m)
200318-65	65 ft. (19.8 m)
200318-70	70 ft. (21.3 m)
200318-75	75 ft. (22.9 m)
200318-80	80 ft. (24.4 m)
200318-85	85 ft. (25.9 m)
200318-90	90 ft. (27.4 m)
200318-95	95 ft. (29.0 m)
200318-100	100 ft. (30.5 m)

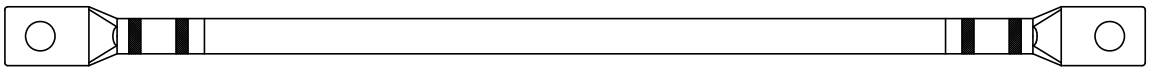


Figure 8-10 Work Ground Cable

Torch Consumables - Mild Steel Cutting

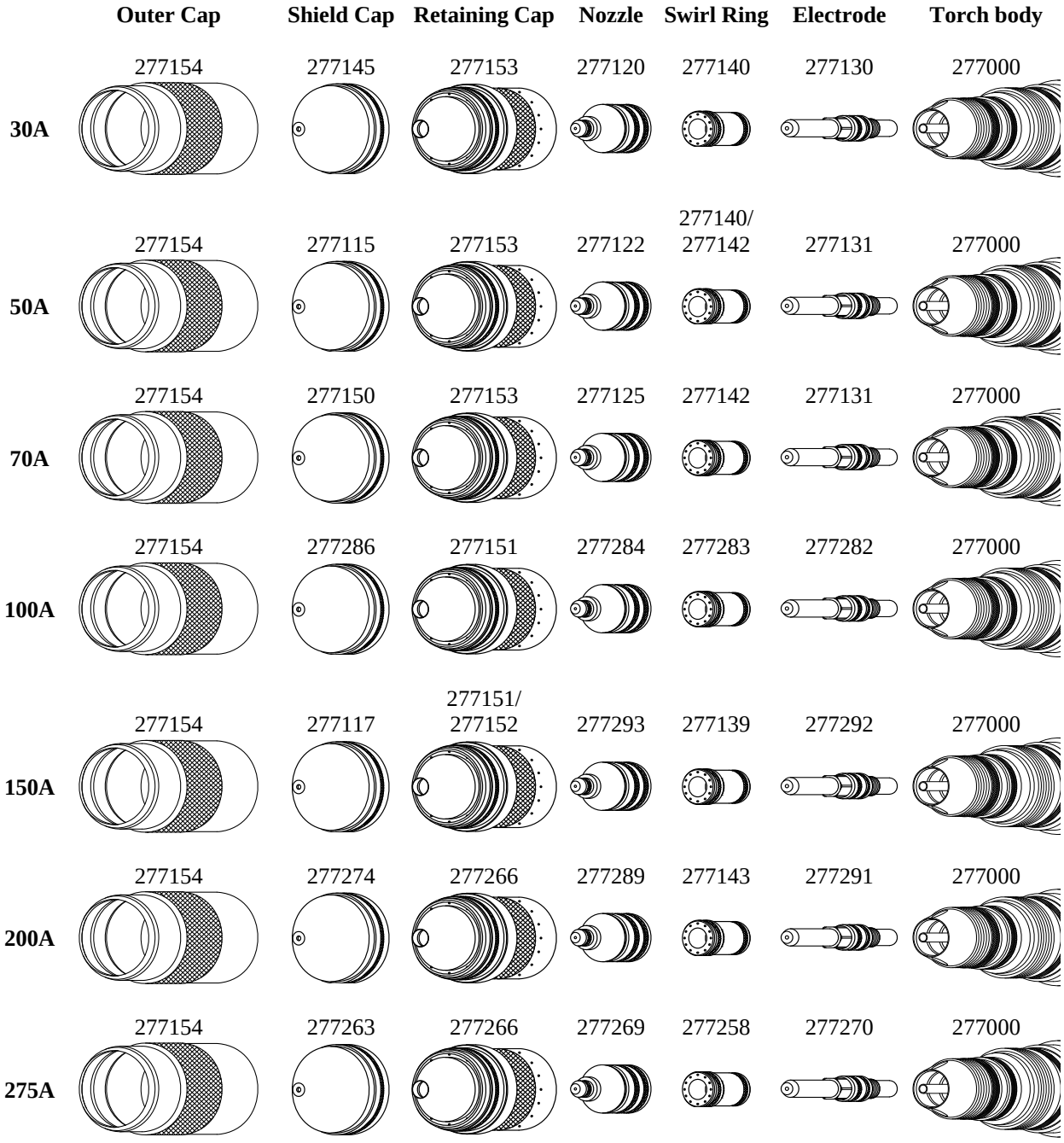


Figure 8-11 Torch Consumables - Mild Steel Cutting

Torch Consumables - Stainless Steel Cutting (Air Plasma)

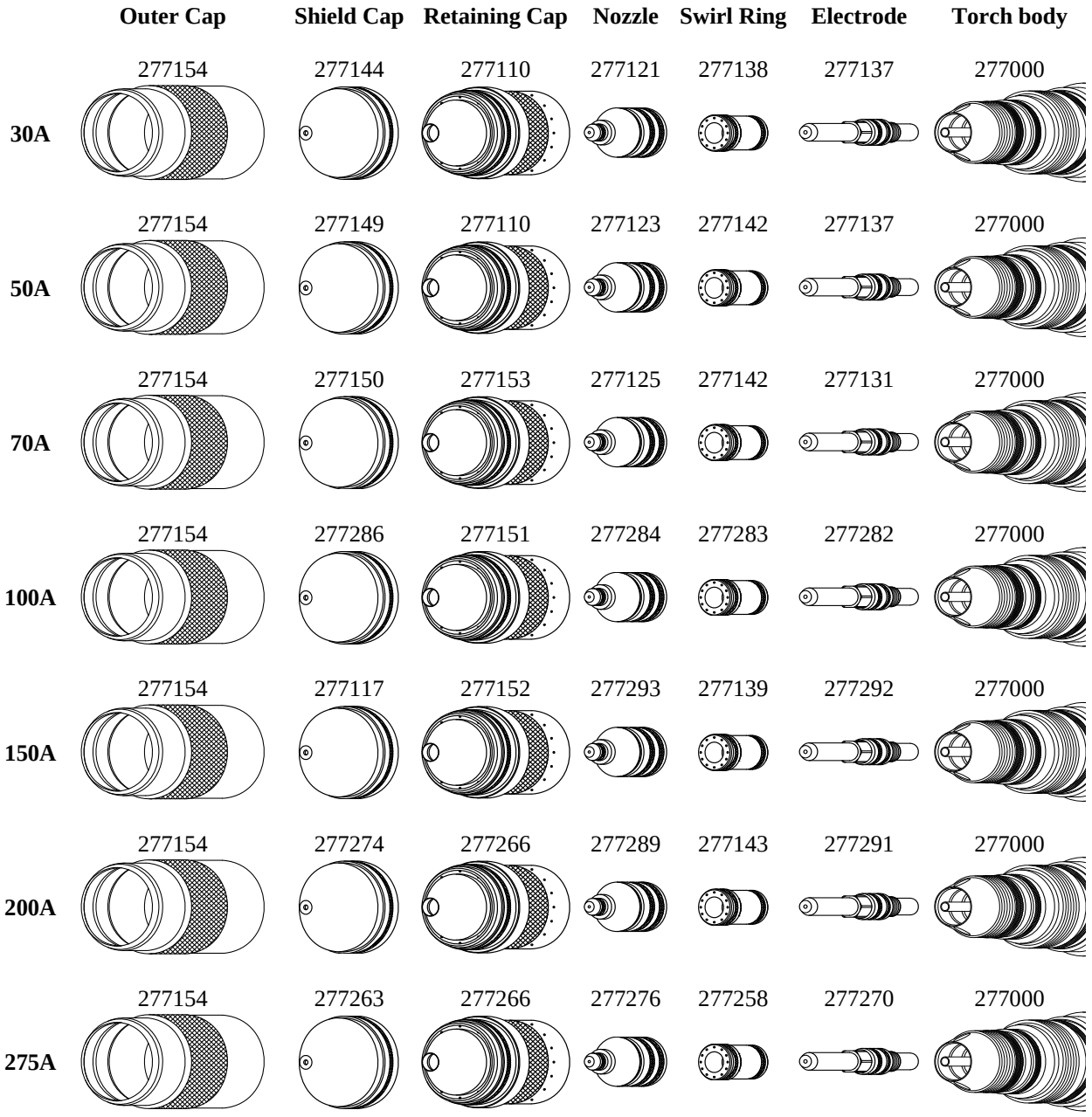


Figure 8-12 Torch Consumables - Stainless Steel Cutting (Air Plasma)

Torch Consumables - Stainless Steel Cutting (H17 Plasma)

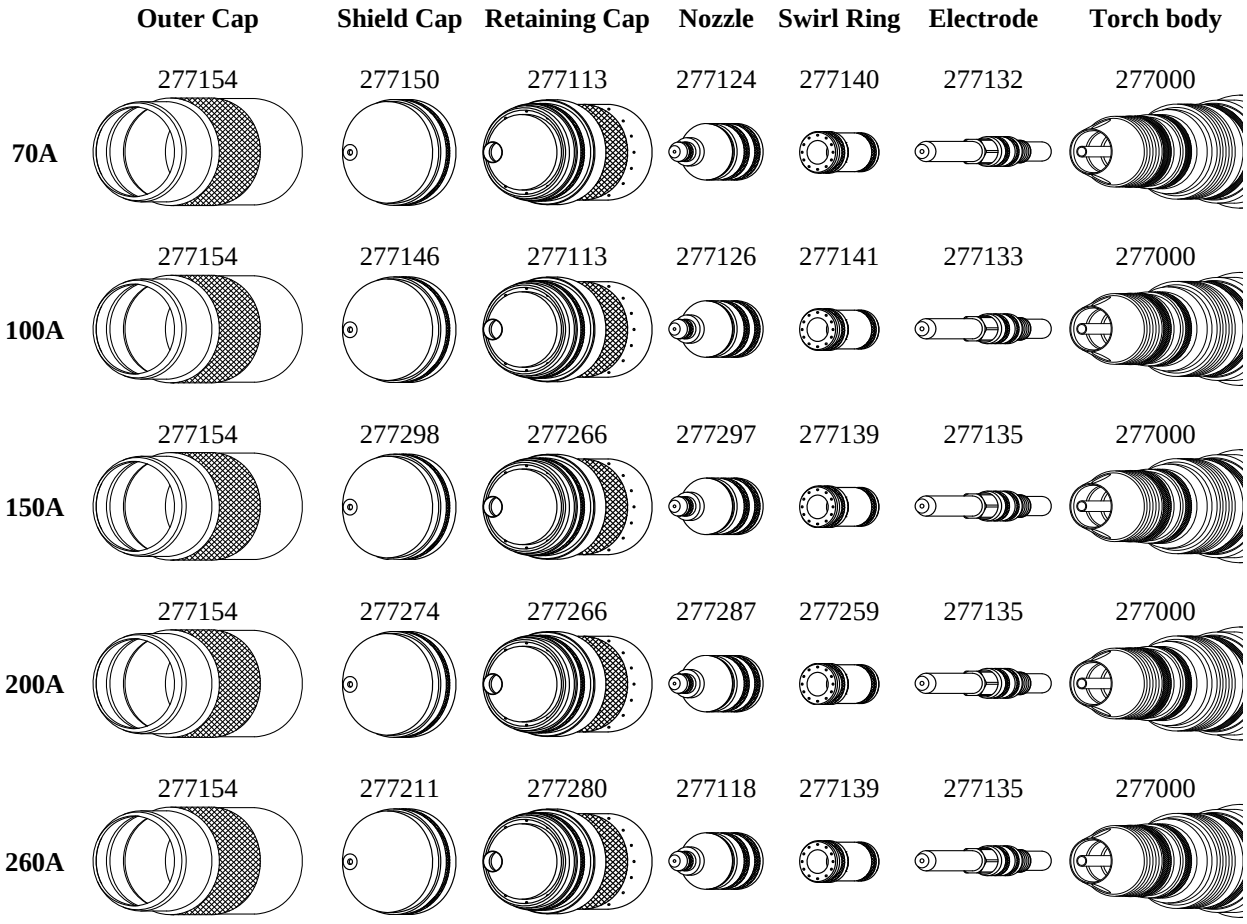


Figure 8-13 Torch Consumables - Stainless Steel Cutting (H17 Plasma)

Torch Consumables - Aluminum Cutting

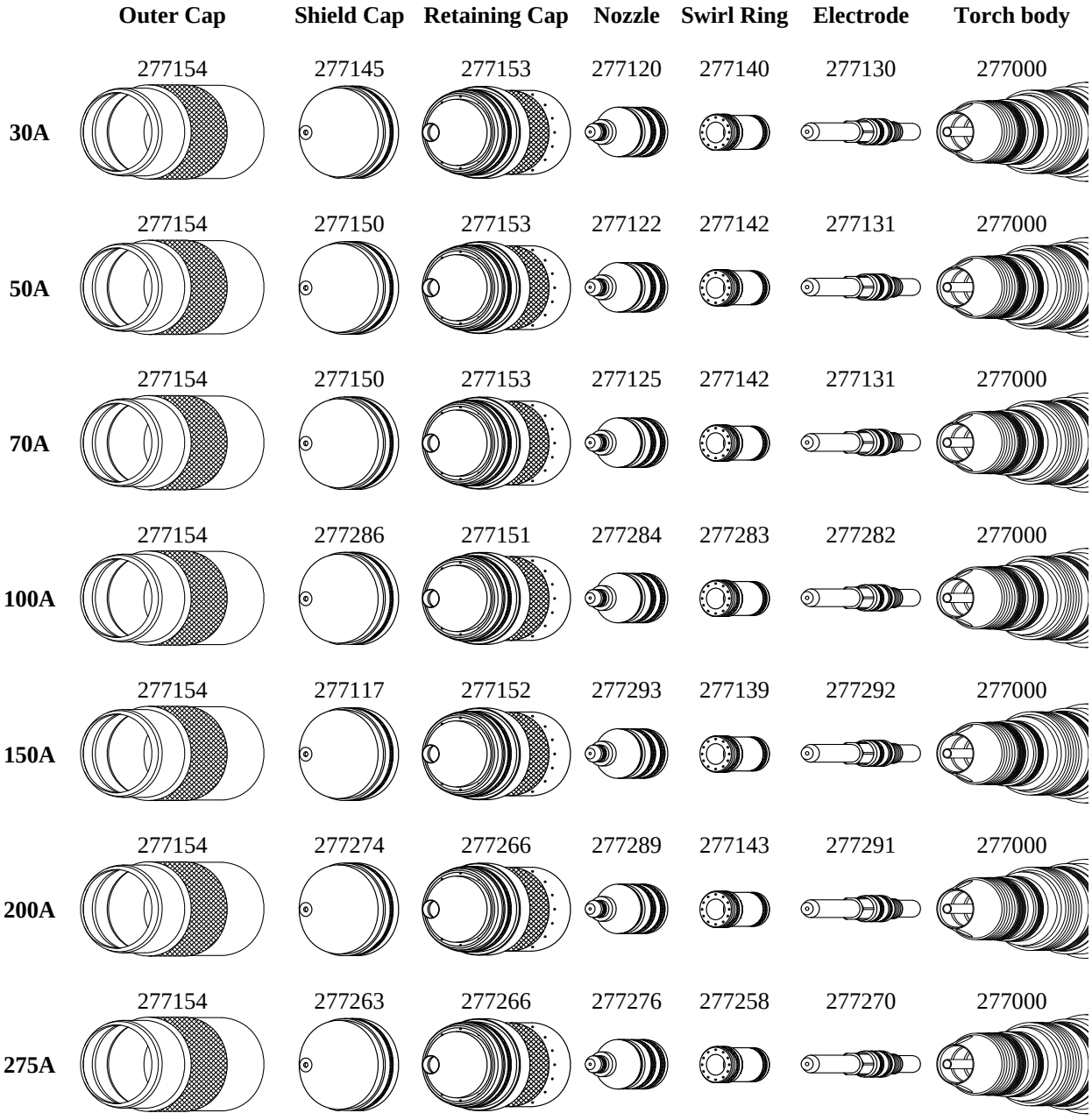


Figure 8-14 Torch Consumables - Aluminum Cutting

Torch Consumables - Marking

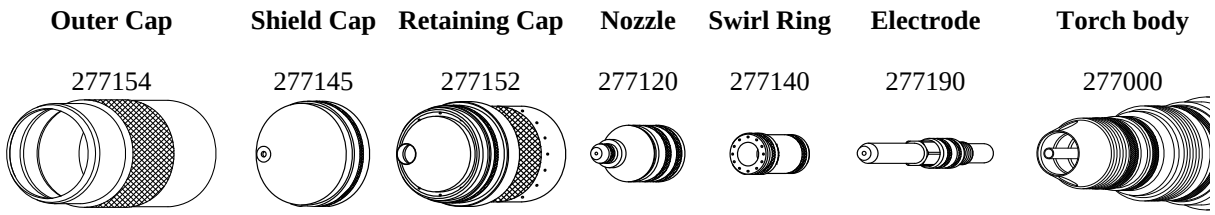


Figure 8-15 Torch Consumables - Marking

Automatic Gas Console (Assembly 260000)

Note: See Figures 8-16 and 8-17.

Item Number	Part Number	Quantity	Description
1	500032	1	AGC decal / membrane switch
2	501146	1	AGC aluminum display panel
3	500860	1	AGC display window
4	710199	4	Aluminum standoff
5	500861	1	AGC EL display
6	706044	1	Transformer, 241-7-16
7	500568	1	Fan
8	501147	1	Fan guard / filter
9	709003	2	Receptacle, 9 position
10	700404	1	Filter bracket
11	702037	5	Filter
12	709179	1	Terminal block, 10 position
13	709192	1	Terminal block marker strip, 10 position
14	505039	1	Floppy disk drive
15	500021	1	Floppy disk drive cover
Not shown	505047	1	Floppy disk drive cable
16	501145	8	Manifold
17	708097	4	Pressure switch, 80-200 psi
18	715097	4	Transducer isolator
19	708095	3	Solenoid valve
20	500867	3	Motorized regulator assembly, 0-125 psi
22	500060	1	Motorized regulator assembly, 0-15 psi
23	709007	1	Terminal block, 14 position
24	709009	1	Terminal block marker strip, 14 position
25	200082	1	Solenoid valve assembly, 3 gang
26	500907	1	Solenoid valve bracket
27	200083	1	Solenoid valve assembly, 4 gang
28	501170	1	Power supply
29	505041	1	Video card (upper p.c. board)
30	260049	1	CPU (middle p.c. board)
31	505600	1	Interface p.c. board assembly (lower p.c. board)
Not shown	260110	1	Video card / CPU / Interface p.c. board assembly
33	201080	1	I/0 p.c. board assembly
34	708078	3	Transducer, 0-150 psi
35	708109	1	Transducer, 0-15 psi

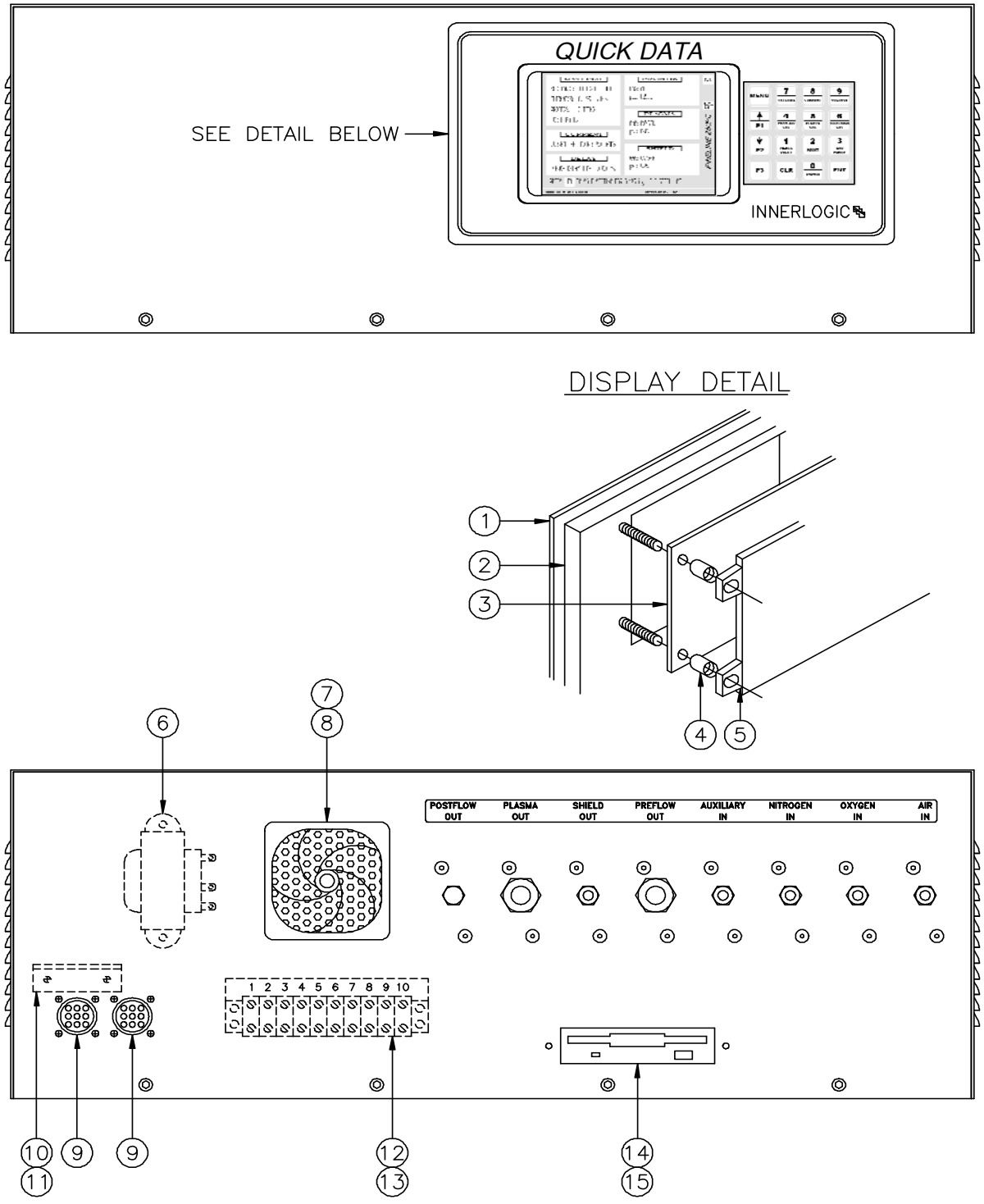


Figure 8-16 Gas Console - Exterior

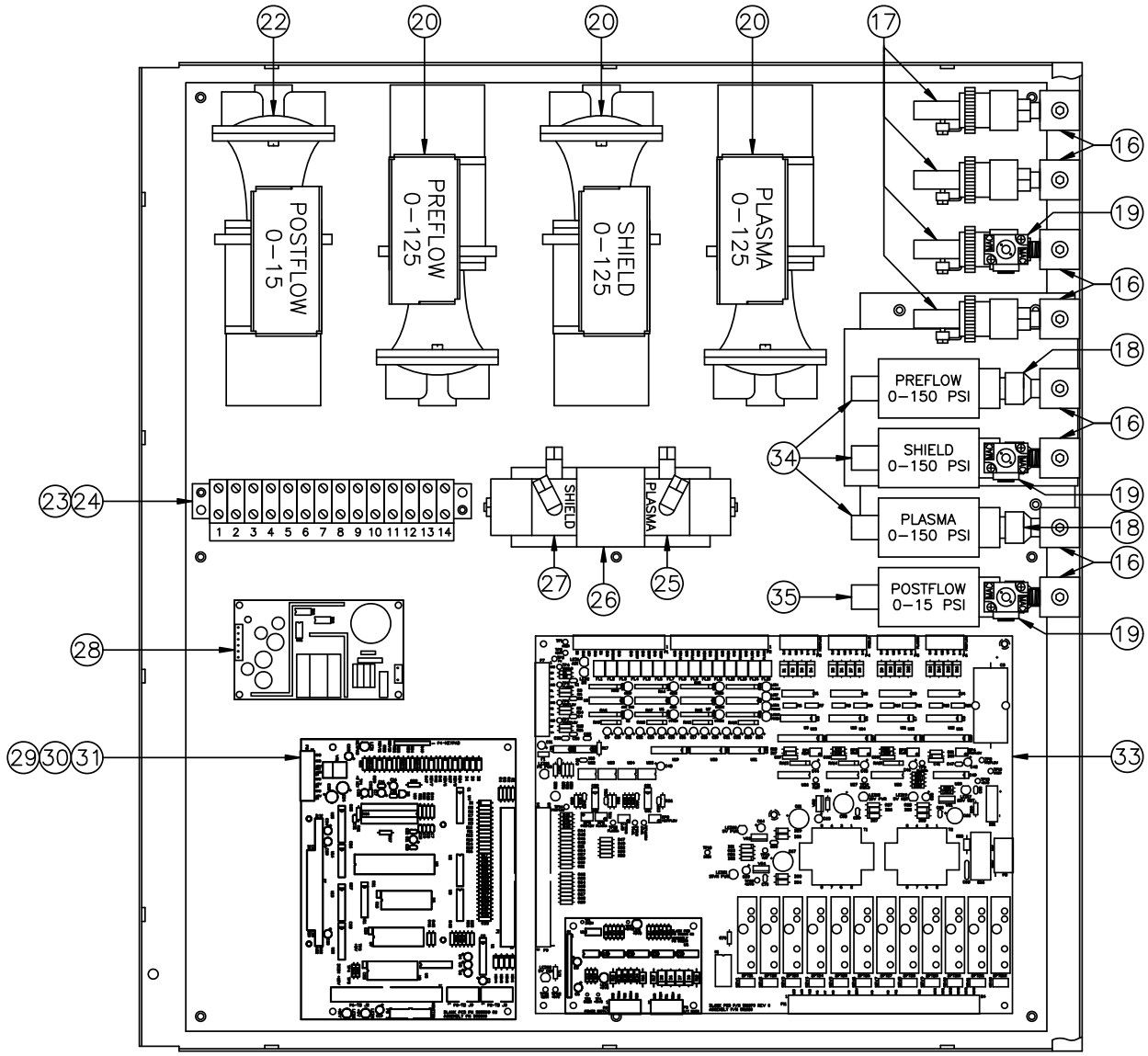


Figure 8-17 Gas Console – Interior

Power Supply Microprocessor P.C. Board (Assembly 260450)

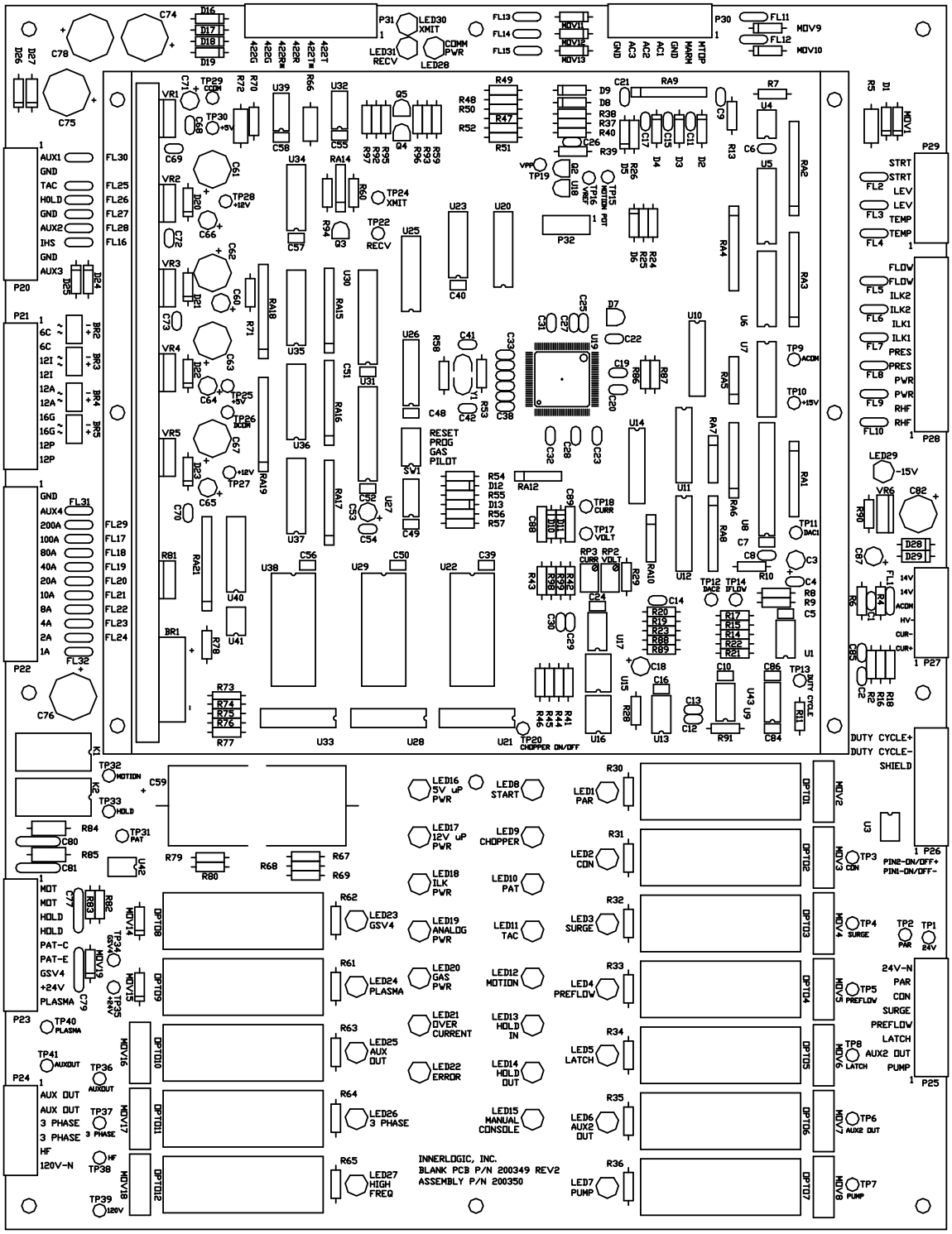


Figure 8-18 Power Supply Microprocessor P.C. Board

A.C. Detect P.C. Board (Assembly 500810)

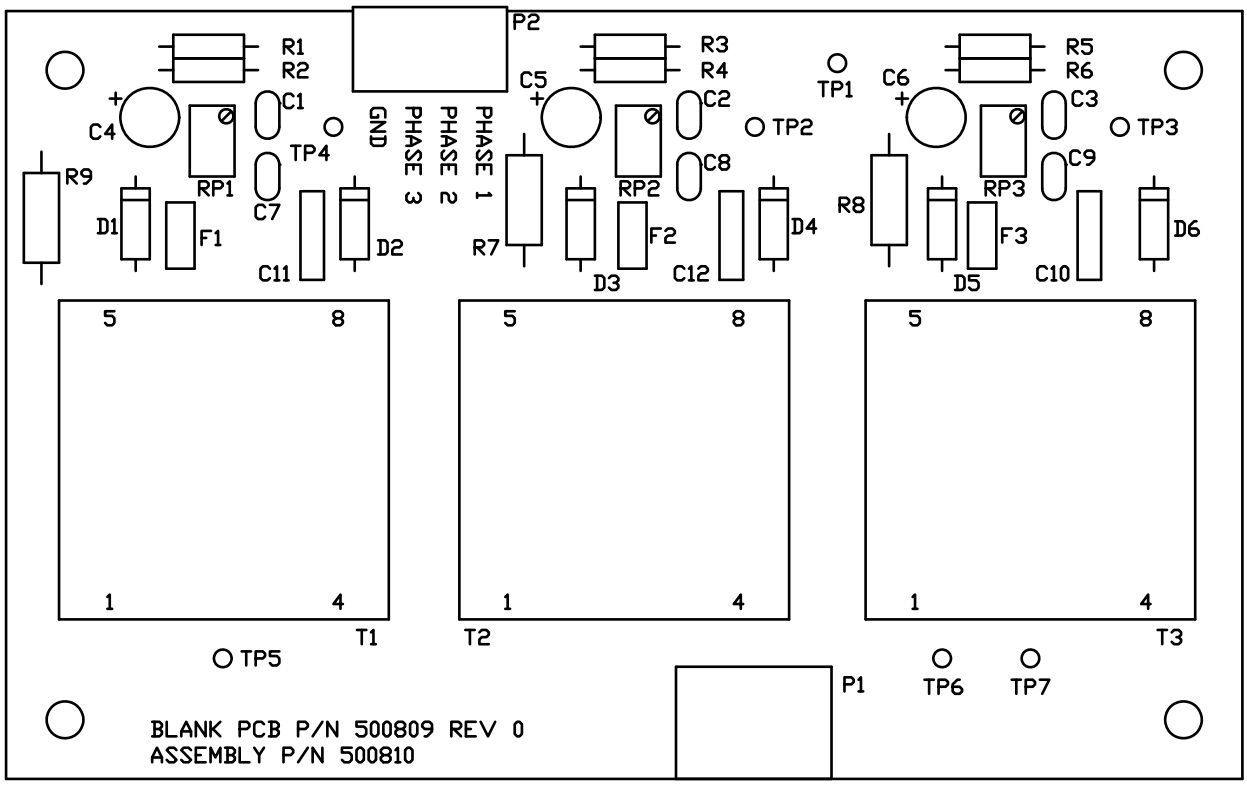


Figure 8-19 A.C. Detect P.C. Board

Relay P.C. Board (Assembly 500348)

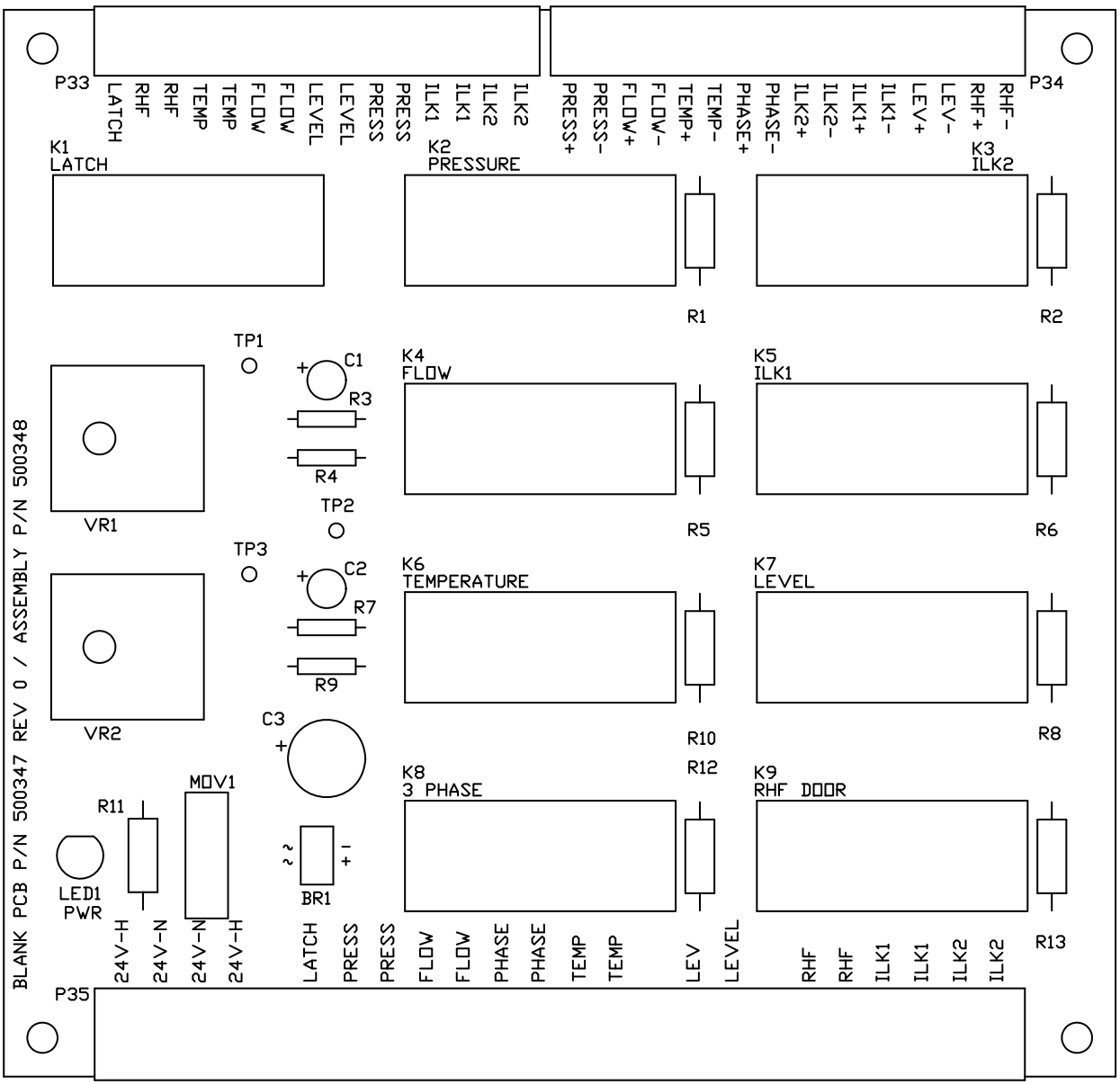


Figure 8-20 Relay P.C. Board

Power Supply I/O P.C. Board (Assembly 277452)

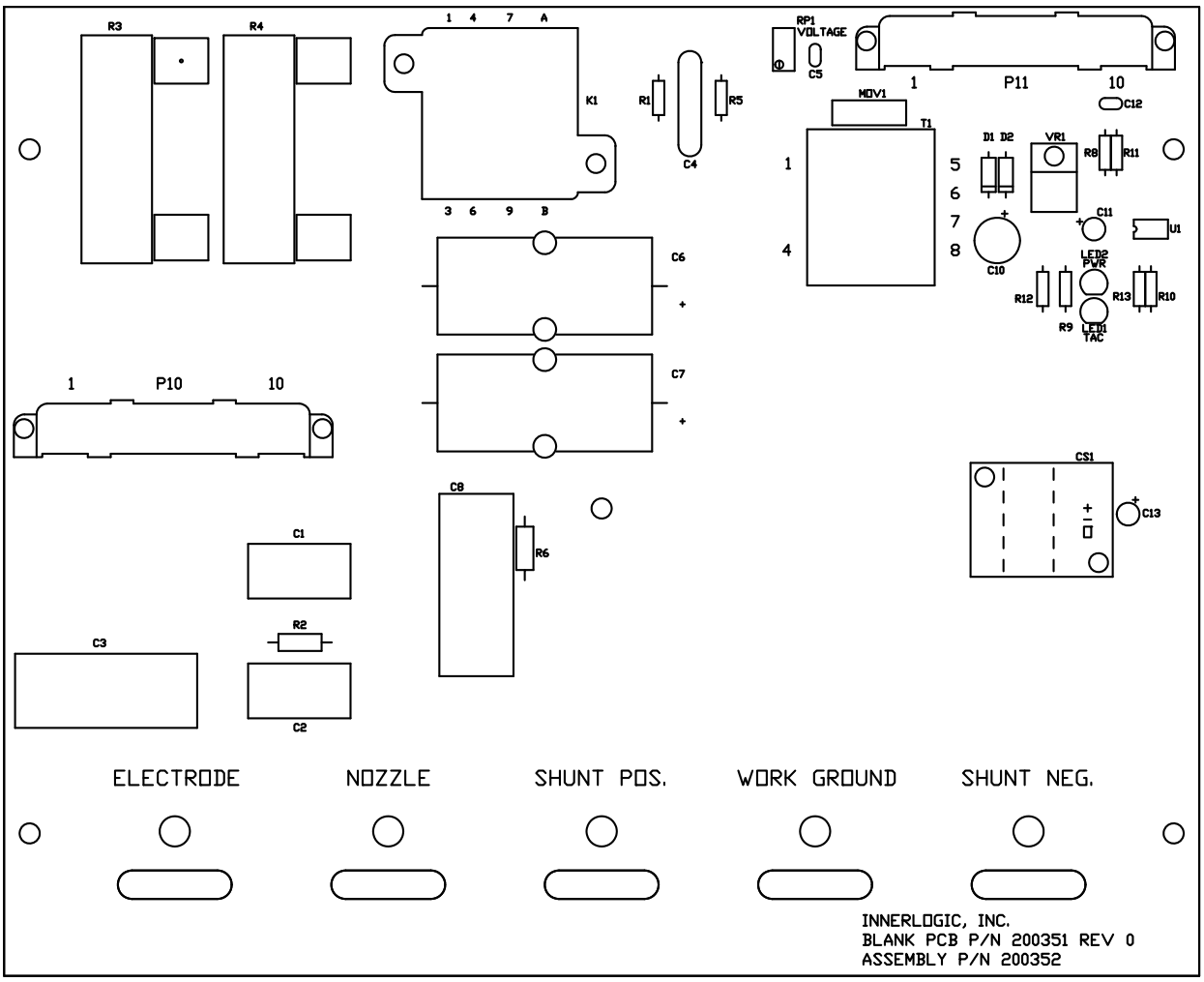


Figure 8-21 Power Supply I/O P.C. Board

Automatic Gas Console I/O P.C. Board (Assembly 201080)

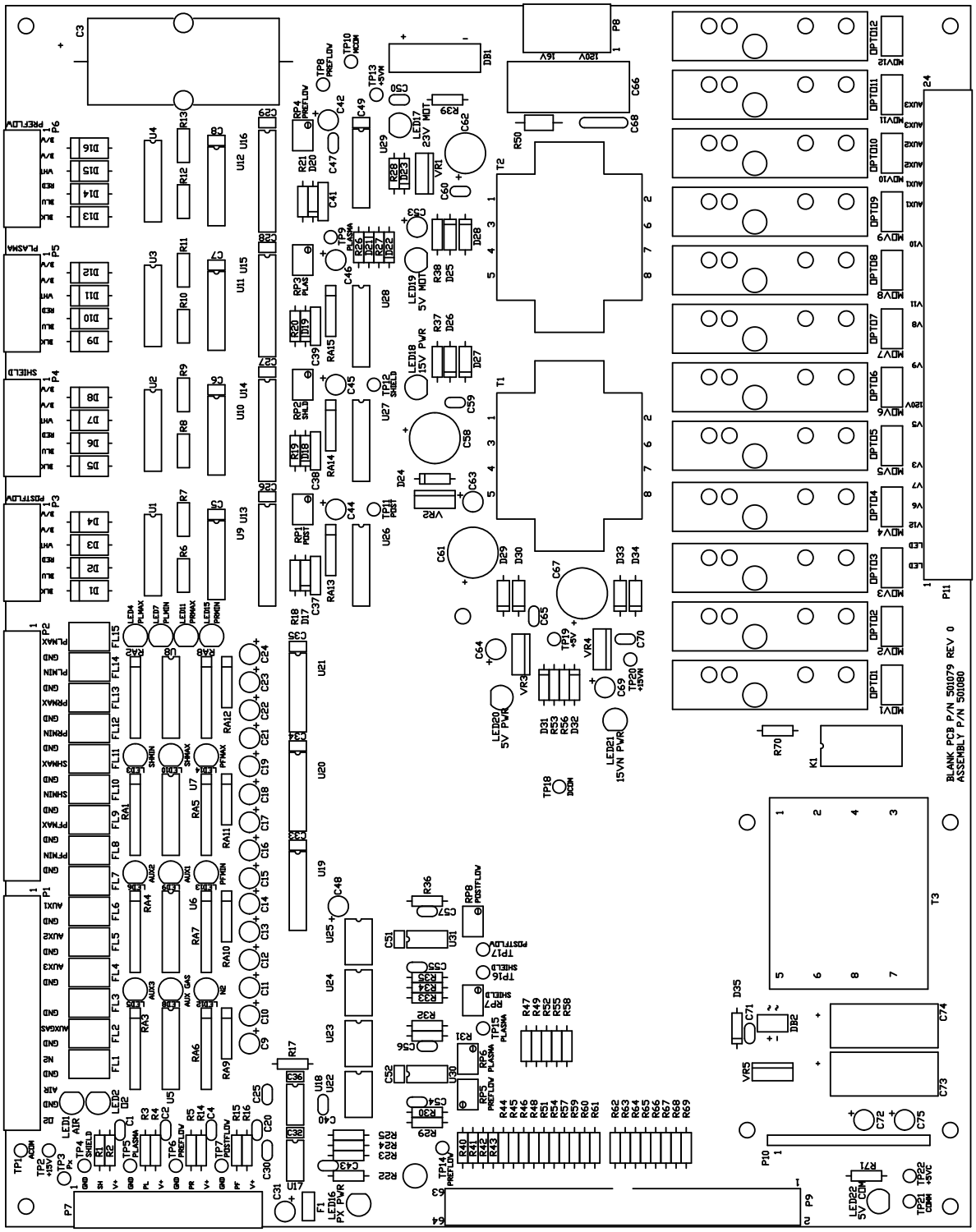


Figure 8-22 Automatic Gas Console I/O P.C. Board

Automatic Gas Console Interface P.C. Board (Assembly 505600)

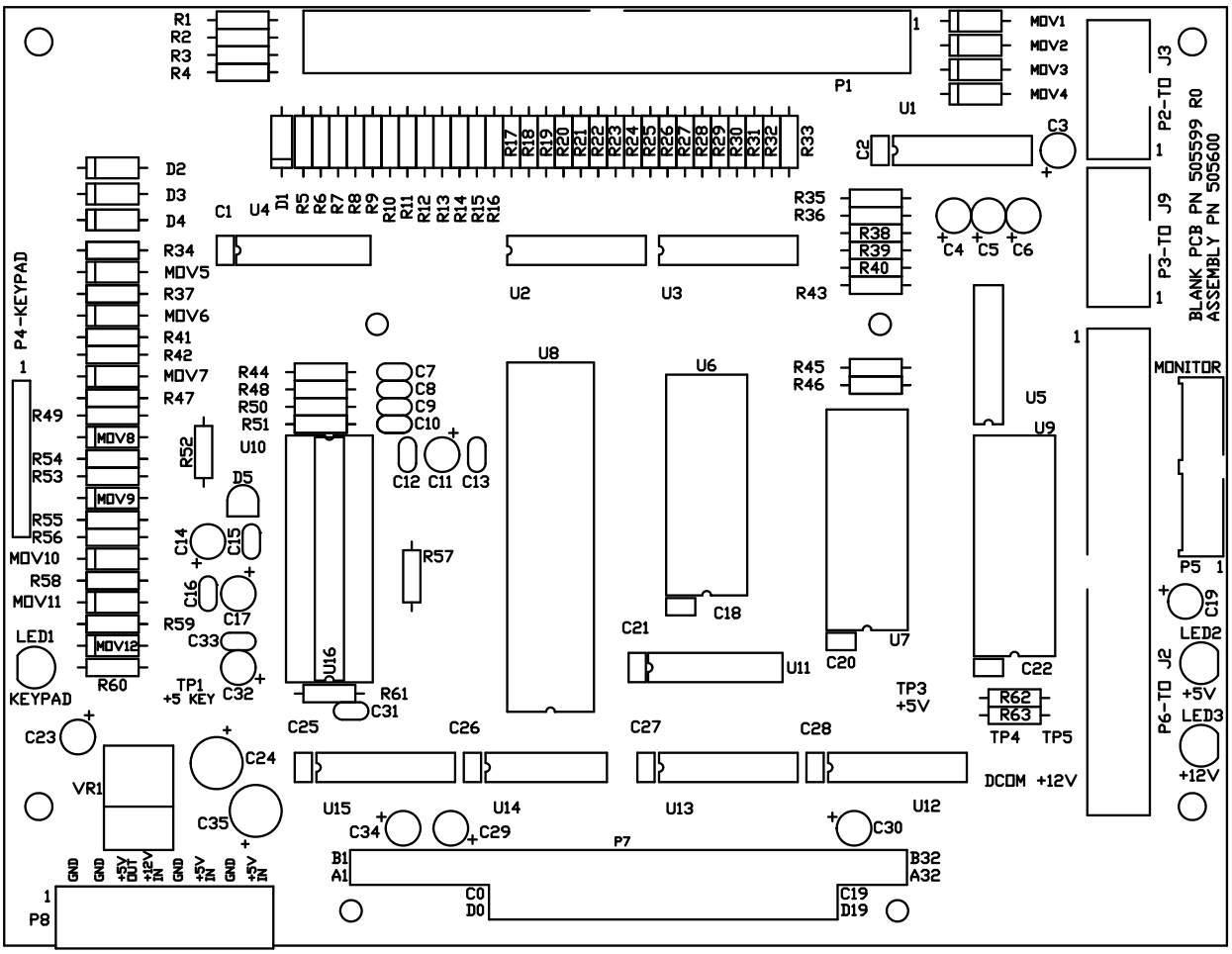


Figure 8-23 Automatic Gas Console Interface P.C. Board

Consumable Spare Parts Kit (Part Number 280267)

Part Number	Quantity	Description
277130	3	Electrode 30A Mild Steel - 30A Aluminum
277137	2	Electrode 30/50A Stainless (Air)
277131	6	Electrode 50/70A Mild Steel - 70A Stainless (Air) - 50/70A Aluminum
277132	2	Electrode 70A Stainless (H17)
277282	3	Electrode 100A Mild Steel - 100A Stainless (Air) - 100A Aluminum
277133	2	Electrode 100A Stainless (H17)
277292	3	Electrode 150A Mild Steel – 150A Stainless (Air) – 150A Aluminum
277291	3	Electrode 200A Mild Steel - 200A Stainless (Air) - 200A Aluminum
277135	2	Electrode 150/200/260A Stainless (H17)
277270	3	Electrode 275A Mild Steel – 275A Stainless (Air) – 275A Aluminum
277120	5	Nozzle 30A Mild Steel - 30A Aluminum
277121	3	Nozzle 30A Stainless (Air)
277122	5	Nozzle 50A Mild Steel - 50A Aluminum
277123	3	Nozzle 50A Stainless (Air)
277125	5	Nozzle 70A Mild Steel - 70A Stainless (Air) - 70A Aluminum
277124	3	Nozzle 70A Stainless (H17)
277284	5	Nozzle 100A Mild Steel – 100A Stainless (Air) - 100A Aluminum
277126	3	Nozzle 100A Stainless (H17)
277293	5	Nozzle 150A Mild Steel – 150A Stainless (Air) – 150A Aluminum
277297	3	Nozzle 150A Stainless (H17)

Part Number	Quantity	Description
277289	5	Nozzle 200A Mild Steel – 200A Stainless (Air) - 200A Aluminum
277287	3	Nozzle 200A Stainless (H17)
277118	3	Nozzle 260A Stainless (H17)
277269	5	Nozzle 275A Mild Steel
277276	3	Nozzle 275A Stainless (Air) – 275A Aluminum
277145	3	Shield Cap 30A Mild Steel - 30A Aluminum
277144	3	Shield Cap 30A Stainless (Air)
277149	3	Shield Cap 50A Stainless (Air)
277115	3	Shield Cap 50A Mild Steel
277150	3	Shield Cap 70A Mild Steel - 70A Stainless - 50/70A Aluminum
277286	3	Shield Cap 100A Mild Steel - 100A Stainless (Air) - 100A Aluminum
277146	3	Shield Cap 100A Stainless (H17)
277117	3	Shield Cap 150A Mild Steel – 150A Stainless (Air) – 150A Aluminum
277298	3	Shield Cap 150A Stainless (H17)
277274	3	Shield Cap 200A Mild Steel - 200A Stainless – 200A Aluminum
277211	3	Shield Cap 260A Stainless (H17)
277263	3	Shield Cap 275A Mild Steel – 275A Stainless (Air) – 275A Aluminum
277138	1	Swirl Ring 30A Stainless (Air)
277140	1	Swirl Ring 30/50A Mild Steel - 70A Stainless (H17) - 30A Aluminum
277142	1	Swirl Ring 50/70A Mild Steel - 50/70A Stainless (Air) - 50/70A Aluminum
277283	1	Swirl Ring 100A Mild Steel – 100A Stainless (Air) – 100A Aluminum
277141	1	Swirl Ring 100A Stainless (H17)

Part Number	Quantity	Description
277139	1	Swirl Ring 150A Mild Steel – 150A Stainless – 150A Aluminum 260A Stainless (H17)
277143	1	Swirl Ring 200A Mild Steel – 200A Stainless (Air) - 200A Aluminum
277259	1	Swirl Ring 200A Stainless (H17)
277258	1	Swirl Ring 275A Mild Steel – 275A Stainless (Air) – 275A Aluminum
277110	1	Inner Retaining Cap 30/50A Stainless (Air)
277153	1	Inner Retaining Cap 30/50/70A Mild Steel - 70A Stainless (Air) 30/50/70A Aluminum
277151	1	Inner Retaining Cap 100A Mild Steel - 100A Stainless (Air) - 100A Aluminum 150A Mild Steel – 1/2" and below
277152	1	Inner Retaining Cap 150A Mild Steel – 5/8" and above – 150A Stainless (Air) 150A Aluminum
277113	1	Inner Retaining Cap 70/100A Stainless (H17)
277266	1	Inner Retaining Cap 150A Stainless (H17) 200/275A Mild Steel – 200A Stainless – 200/275A Aluminum 275A Stainless (Air)
277280	1	Inner Retaining Cap 260A Stainless (H17)
716012	1	O-ring Lubricant
500024	2	Torch O-ring – blue, lower
500018	2	Torch O-ring – red, middle
820209	2	Torch O-ring – black, upper
277056	1	Nozzle Removal Tool
277086	1	Electrode Removal Tool Driver
277087	1	Electrode Removal Tool Socket
260105	1	Swirl Ring Removal Tool
277154	1	Outer Retaining Cap

Appendix A Propylene Glycol MSDS

Material Safety Data Sheet
The Dow Chemical Company

Product Name: Propylene Glycol Industrial Grade

Issue Date: 03/02/2006
Print Date: 24 Jul 2007

The Dow Chemical Company encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. Product and Company Identification

Product Name
Propylene Glycol Industrial Grade

COMPANY IDENTIFICATION
The Dow Chemical Company
2030 Willard H. Dow Center
Midland, MI 48674
USA

Customer Information Number: 800-258-2436

EMERGENCY TELEPHONE NUMBER
24-Hour Emergency Contact: 989-636-4400
Local Emergency Contact: 989-636-4400

2. Hazards Identification

Emergency Overview
Color: Colorless
Physical State: Liquid
Odor: Odorless
Hazards of product:

No significant immediate hazards for emergency response are known.

OSHA Hazard Communication Standard
This product is not a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Potential Health Effects
Eye Contact: May cause slight temporary eye irritation. Corneal injury is unlikely. Mist may cause eye irritation.
Skin Contact: Prolonged contact is essentially nonirritating to skin. Repeated contact may cause flaking and softening of skin.
Skin Absorption: Prolonged skin contact is unlikely to result in absorption of harmful amounts.
Inhalation: At room temperature, exposure to vapor is minimal due to low volatility. Mist may cause irritation of upper respiratory tract (nose and throat).

* Indicates a Trademark

Ingestion: Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts.
Effects of Repeated Exposure: In rare cases, repeated excessive exposure to propylene glycol may cause central nervous system effects.

3. Composition Information

Component	CAS #	Amount
Propylene glycol	57-55-6	> 99.5 %

4. First-aid measures

Eye Contact: Flush eyes thoroughly with water for several minutes. Remove contact lenses after the initial 1-2 minutes and continue flushing for several additional minutes. If effects occur, consult a physician, preferably an ophthalmologist.
Skin Contact: Wash skin with plenty of water.
Inhalation: Move person to fresh air; if effects occur, consult a physician.
Ingestion: No emergency medical treatment necessary.
Notes to Physician: No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

5. Fire Fighting Measures

Extinguishing Media: Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. Do not use direct water stream. May spread fire. Alcohol resistant foams (ATC type) are preferred. General purpose synthetic foams (including AFFF) or protein foams may function, but will be less effective.
Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of reignition has passed. Fight fire from protected location or safe distance. Consider the use of unmanned hose holders or monitor nozzles. Immediately withdraw all personnel from the area in case of rising sound from venting safety device or discoloration of the container. Burning liquids may be extinguished by dilution with water. Do not use direct water stream. May spread fire. Move container from fire area if this is possible without hazard. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage.
Special Protective Equipment for Firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.
Unusual Fire and Explosion Hazards: Container may rupture from gas generation in a fire situation. Violent steam generation or eruption may occur upon application of direct water stream to hot liquids.
Hazardous Combustion Products: During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Carbon monoxide. Carbon dioxide.

6. Accidental Release Measures

Steps to be Taken if Material is Released or Spilled: Contain spilled material if possible. Small spills: Any absorbent material. Collect in suitable and properly labeled open containers. Wash the spill site with large quantities of water. Large spills: Dike area to contain spill. Pump into suitable and properly labeled containers. See Section 13, Disposal Considerations, for additional information.

Personal Precautions: Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection. Keep unnecessary and unprotected personnel from entering the area. Spilled material may cause a slipping hazard.
Environmental Precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

7. Handling and Storage

Handling
General Handling: Product handled hot may require additional ventilation or local exhaust.
Other Precautions: Spills of these organic materials on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion.

Storage
Store away from direct sunlight or ultraviolet light. Keep container tightly closed when not in use. Store in a dry place. Protect from atmospheric moisture. Store in the following material(s): Stainless steel. Aluminum. Plasite 3066 lined container. 316 stainless steel. Opaque HDPE plastic container.

Shelf life: Use within	Maximum storage temperature
12.0 Months	40 °C

8. Exposure Controls / Personal Protection

Exposure Limits

Component	List	Type	Value
Propylene glycol	WEEL	TWA Aerosol.	10 mg/m3

Personal Protection
Eye/Face Protection: Safety glasses should be sufficient for most operations; however, for misty operations wear chemical goggles.
Skin Protection: No precautions other than clean body-covering clothing should be needed.
Hand protection: Chemical protective gloves should not be needed when handling this material. Consistent with general hygienic practice for any material, skin contact should be minimized.
Respiratory Protection: Atmospheric levels should be maintained below the exposure guideline. When respiratory protection is required for certain operations, use an approved air-purifying respirator. In misty atmospheres, use an approved particulate respirator. The following should be effective types of air-purifying respirators: Organic vapor with acid gas cartridge and particulate pre-filter.
Ingestion: Use good personal hygiene. Do not consume or store food in the work area. Wash hands before smoking or eating.

Engineering Controls
Ventilation: Provide general and/or local exhaust ventilation to control airborne levels below the exposure guidelines.

9. Physical and Chemical Properties

Physical State	Liquid
Color	Colorless
Odor	Odorless
Flash Point - Closed Cup	103 °C (217 °F) *Literature* (PMCC)

Flammable Limits In Air	**Lower**: 2.6 %(V) *Estimated* **Upper**: 12.5 %(V) *Estimated*
Autoignition Temperature	371 °C (700 °F) *Literature*
Vapor Pressure	0.3 mbar @ 25 °C *Literature*
Boiling Point (760 mmHg)	187.4 °C (369.3 °F) *Literature* .
Vapor Density (air = 1)	2.62 *Literature*
Specific Gravity (H2O = 1)	1.04 20 °C/20 °C *Literature*
Freezing Point	No test data available
Melting Point	No test data available
Solubility in Water (by weight)	100 %
pH	Not applicable
Evaporation Rate (Butyl Acetate = 1)	0.02 *Estimated*
Dynamic Viscosity	48.6 mPs @ 25 °C *Literature*
Pour point	< -57 °C (< -71 °F) *Literature*

10. Stability and Reactivity

Stability/Instability
Stable under recommended storage conditions. See Storage, Section 7. Hygroscopic.
Conditions to Avoid: Exposure to elevated temperatures can cause product to decompose. Generation of gas during decomposition can cause pressure in closed systems. Avoid direct sunlight or ultraviolet sources.

Incompatible Materials: Avoid contact with: Strong acids. Strong bases. Strong oxidizers.

Hazardous Polymerization
Will not occur.

Thermal Decomposition
Decomposition products depend upon temperature, air supply and the presence of other materials. Decomposition products can include and are not limited to: Aldehydes. Alcohols. Ethers. Organic acids.

11. Toxicological Information

Acute Toxicity
Ingestion
LD50, Rat 20,000 - 34,000 mg/kg
Skin Absorption
LD50, Rabbit > 20,000 mg/kg
Repeated Dose Toxicity
In rare cases, repeated excessive exposure to propylene glycol may cause central nervous system effects.
Chronic Toxicity and Carcinogenicity
Did not cause cancer in laboratory animals.
Developmental Toxicity
Did not cause birth defects or any other fetal effects in laboratory animals.
Reproductive Toxicity
In animal studies, did not interfere with reproduction.
Genetic Toxicology
In vitro genetic toxicity studies were negative. Animal genetic toxicity studies were negative.

12. Ecological Information

CHEMICAL FATE

Data for Component: **Propylene glycol**

Movement & Partitioning

Bioconcentration potential is low (BCF less than 100 or log Pow less than 3). Potential for mobility in soil is very high (Koc between 0 and 50). Given its very low Henry's constant, volatilization from natural bodies of water or moist soil is not expected to be an important fate process.

Henry's Law Constant (H): 1.2E-8 atm*m3/mole Measured

Partition coefficient, n-octanol/water (log Pow): -0.92 Measured

Partition coefficient, soil organic carbon/water (Koc): < 1 Estimated

Persistence and Degradability

Material is readily biodegradable. Passes OECD test(s) for ready biodegradability. Biodegradation may occur under anaerobic conditions (in the absence of oxygen).

Indirect Photodegradation with OH Radicals

Rate Constant	Atmospheric Half-life	Method
1.28E-11 cm3/s	10 h	Estimated

OECD Biodegradation Tests:

Biodegradation	Exposure Time	Method
81 %	28 d	OECD 301F Test
95.8 %	64 d	OECD 306 Test

Biological oxygen demand (BOD):

BOD 5	BOD 10	BOD 20	BOD 28
69 %	70 %	86 %	

Chemical Oxygen Demand: 1.53 mg/mg

Theoretical Oxygen Demand: 1.68 mg/mg

ECOTOXICITY

Data for Component: **Propylene glycol**

Material is practically non-toxic to aquatic organisms on an acute basis (LC50/EC50 >100 mg/L in the most sensitive species tested).

Fish Acute & Prolonged Toxicity

LC50, rainbow trout (Oncorhynchus mykiss), 96 h: 44,000 - 51,600 mg/l

Aquatic Invertebrate Acute Toxicity

EC50, water flea Daphnia magna, 48 h, immobilization: 4,850 - 34,000 mg/l

LC50, saltwater mysid Mysidopsis bahia, static, 96 h: 18,800 mg/l

Aquatic Plant Toxicity

EC50, green alga Selenastrum capricornutum, biomass growth inhibition: 19,000 mg/l

Toxicity to Micro-organisms

EC50, OECD 209 Test; activated sludge, respiration inhibition, 3 h: > 1,000 mg/l

13. Disposal Considerations

DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. DOW HAS NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION: Composition Information. FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options

include sending to a licensed, permitted: Recycler. Reclaimer. Incinerator or other thermal destruction device. As a service to its customers, Dow can provide names of information resources to help identify waste management companies and other facilities which recycle, reprocess or manage chemicals or plastics, and that manage used drums. Telephone Dow's Customer Information Group at 1-800-258-2436 or 1-989-832-1556 (U.S.), or 1-800-331-6451 (Canada) for further details.

14. Transport Information

DOT Non-Bulk
NOT REGULATED

DOT Bulk
NOT REGULATED

IMDG
NOT REGULATED

ICAO/IATA
NOT REGULATED

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. Regulatory Information

OSHA Hazard Communication Standard
This product is not a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312

Immediate (Acute) Health Hazard	No
Delayed (Chronic) Health Hazard	No
Fire Hazard	No
Reactive Hazard	No
Sudden Release of Pressure Hazard	No

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Hazardous Substances List and/or Pennsylvania Environmental Hazardous Substance List:
The following product components are cited in the Pennsylvania Hazardous Substance List and/or the Pennsylvania Environmental Substance List, and are present at levels which require reporting.

Component	CAS #	Amount
Propylene glycol	57-55-6	>= 99.5 %

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Special Hazardous Substances List:
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) Section 103
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

US. EPA Emergency Planning and Community Right-To-Know Act (EPCRA) SARA Title III Section 302 Extremely Hazardous Substance (40 CFR 355, Appendix A)
To the best of our knowledge, this product does not contain chemicals at levels which require reporting under this statute.

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986)
This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

US. Toxic Substances Control Act
All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30
CEPA - Domestic Substances List (DSL)
All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.
European Inventory of Existing Commercial Chemical Substances (EINECS)
The components of this product are on the EINECS inventory or are exempt from inventory requirements.

16. Other Information

Product Literature
Additional information on this and other Dow products may be obtained by visiting our web page at www.dow.com.

Hazard Rating System

NFPA	Health	Fire	Reactivity
	0	1	0

Recommended Uses and Restrictions
Dow recommends that you use this product in a manner consistent with the listed use. If your intended use is not consistent with Dow's stated use, please contact Dow's Customer Information Group. Chemical intermediate, e.g. for manufacture of polyester resins. Solvent. De-icing fluid. This particular grade of propylene glycol is not recommended for use in pharmaceutical, food (including animal feed) or cosmetic-type applications. For those applications which involve human and animal exposure/consumption, Propylene Glycol USP/EP should be used.

Revision
Identification Number: 40808 / 1001 / Issue Date 03/02/2006 / Version: 2.0
Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

N/A	Not available
W/W	Weight/Weight
OEL	Occupational Exposure Limit
STEL	Short Term Exposure Limit
TWA	Time Weighted Average
ACGIH	American Conference of Governmental Industrial Hygienists, Inc.
DOW IHG	Dow Industrial Hygiene Guideline
WEEL	Workplace Environmental Exposure Level
HAZ_DES	Hazard Designation

The Dow Chemical Company urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.

Appendix B Electromagnetic Compatibility (EMC)

Background

The 380V 50Hz and 415V 50Hz FineLine 260PC plasma cutting systems are manufactured to comply with the European standard EN 50199 (Electromagnetic compatibility (EMC) – Product standard for arc welding equipment). The limits used in this standard are based on practical experience. However, the ability of plasma cutting equipment to work in a compatible manner with other radio and electronic systems is greatly influenced by the manner in which it is installed and used. For this reason, it is important that the plasma cutting equipment be installed and used in accordance with the information below if electromagnetic compatibility is to be achieved.

Plasma cutting equipment is primarily intended for use in an industrial environment. There may be potential difficulties in ensuring electromagnetic compatibility in other environments.

Installation and Use

The user is responsible for installing and using the plasma cutting equipment according to the manufacturer's instructions. If electromagnetic disturbances are detected then it shall be the responsibility of the user of the plasma cutting equipment to resolve the situation with the technical assistance of the manufacturer. In some cases this remedial action may be as simple as earthing the plasma cutting circuit, see Note. In other cases it could involve constructing an electromagnetic screen enclosing the plasma power source and the work, complete with associated input filters. In all cases, electromagnetic disturbances shall be reduced to the point where they are no longer troublesome.

Note: The plasma cutting circuit may or may not be earthed for safety reasons. Changing the earthing arrangements should only be authorized by a person who is competent to assess whether the changes will increase the risk of injury, e.g. by allowing parallel plasma cutting current return paths which may damage the earth circuits of other equipment. Further guidance is given in IEC 974-13 *Arc welding equipment – Installation and use.*

Assessment of Area

Before installing plasma cutting equipment, the user shall make an assessment of potential electromagnetic problems in the surrounding area. The following shall be taken into account:

a) other supply cables, control cables, signaling and telephone cables; above, below and adjacent to the plasma cutting equipment;
b) radio and television transmitters and receivers;
c) computer and other control equipment;
d) safety critical equipment, e.g. guarding of industrial equipment;
e) the health of the people around, e.g. the use of pacemakers and hearing aids;
f) equipment used for calibration or measurement;
g) the immunity of other equipment in the environment; the user shall ensure that other equipment being used in the environment is compatible; this may require additional protection measures;
h) the time of day that plasma cutting or other activities are to be carried out.

The size of the surrounding area to be considered will depend on the structure of the building and other activities that are taking place. The surrounding area may extend beyond the boundaries of the premises.

Methods of Reducing Emissions

Mains Supply

Plasma cutting equipment should be connected to the mains supply according to the manufacturer's recommendations. If interference occurs, it may be necessary to take additional precautions such as filtering of the mains supply. Consideration should be given to shielding the supply cable of permanently installed plasma cutting equipment in metallic conduit or equivalent. Shielding should be electrically continuous throughout its length. The shielding should be connected to the plasma power source so that good electrical contact is maintained between the conduit and the plasma power source enclosure.

Maintenance of the Plasma Cutting Equipment

The plasma cutting equipment should be routinely maintained according to the manufacturer's recommendations. All access and service doors and covers should be closed and properly fastened when the plasma cutting equipment is in operation. The plasma cutting equipment should not be modified in any way except for those changes and adjustments covered in the manufacturer's instructions. In particular, the spark gaps of arc striking and stabilizing devices should be adjusted and maintained according to the manufacturer's recommendations.

Plasma Cutting Cables
The plasma cutting cables should be kept as short as possible and should be positioned close together, running at or close to the floor level.

Equipotential Bonding
Bonding of all metallic components in the plasma cutting installation and adjacent to it should be considered. However, metallic components bonded to the workpiece will increase the risk that the operator could receive a shock by touching these metallic components and the electrode at the same time. The operator should be insulated from all such bonded metallic components.

Earthing of the Workpiece
Where the workpiece is not bonded to earth for electrical safety, nor connected to earth because of its size and position, e.g. ship's hull or building steelwork, a connection bonding the workpiece to earth may reduce emissions in some, but not all instances. Care should be taken to prevent the earthing of the workpiece increasing the risk of injury to users, or damage to other electrical equipment. Where necessary, the connection of the workpiece to earth should be made by a direct connection to the workpiece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitance, selected according to national regulations.

Screening and Shielding
Selective screening and shielding of other cables and equipment in the surrounding area may alleviate problems of interference. Screening of the entire welding installation may be considered for special applications.

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Appendix C Hydrogen Manifold (Optional)

Description

The hydrogen manifold can be used when cutting stainless steel at least 3/16" (4.75 mm) thick and a smooth, shiny cut surface finish is desired. When using the manifold, H17 (17.5% hydrogen / 32.5% argon / 50% nitrogen) must be connected to the inlet port and the plasma outlet hose must be connected to the outlet port. The manifold is fully integrated with the operating software of the automatic gas console.

Specifications

Stock Number 260535
Height .....5.3 in (135 mm)
Width ..... 10.1 in (257 mm)
Depth .....9.5 in (241 mm)
Weight .....12 lb (5.4 kg)

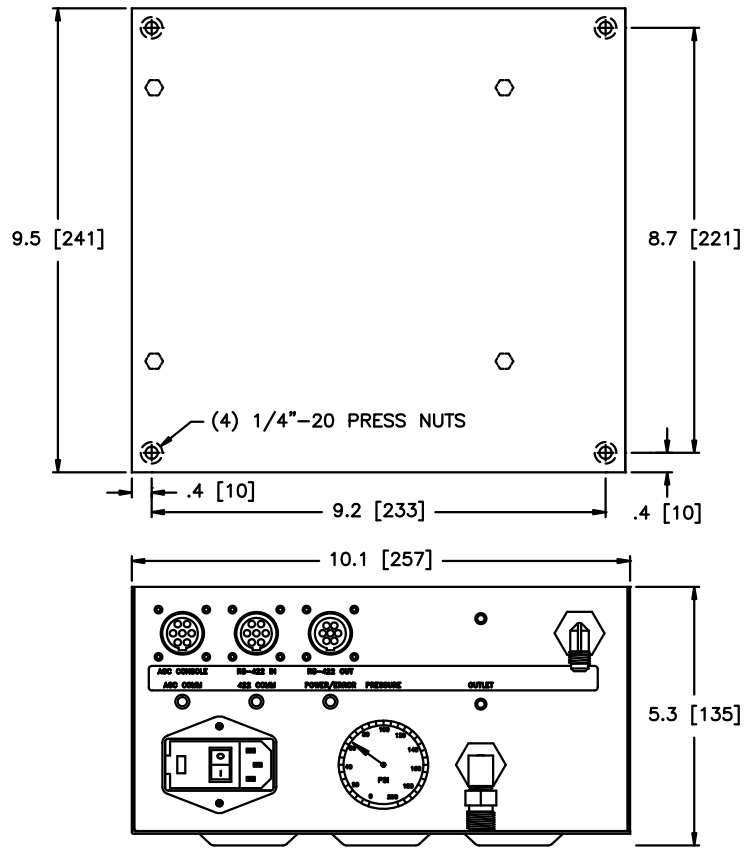


Figure C-1 Hydrogen Manifold Mounting Dimensions

Gas Supply Requirements

Inlet gas type H17*
Inlet gas flow rate (maximum) .....57 scfh (1614 liters/hour)
Inlet gas pressure .....150 psi (10.3 bar)
* H17 consists of 17.5% hydrogen, 32.5% argon, and 50% nitrogen

A 1/4" (inside diameter) hose is required for the inlet gas connection. A mating connector is supplied with the unit. **A quick-connect fitting must not be used for the inlet gas supply.** Using a quick-connect fitting to connect and disconnect a pressurized hose may cause damage to the system.

Installation

The hydrogen manifold must be installed on the cooling system shelf of the FineLine 260PC power supply. The cooling system shelf is located at the rear of the unit as shown in Figure C-2. Use 1/4-20 bolts and 1/4" lock washers to secure the hydrogen manifold to the shelf. **Note that the bolts must not be longer than 1/2" or the manifold may be damaged.** Next, the RS-422 communication cable must be installed between one of the communication ports on the rear of the automatic gas console and the plug labeled "AGC Console" on the hydrogen manifold. Finally, the power cable must be installed between the plug labeled "P13" on the rear of the FineLine 260PC power supply and the input power adaptor on the hydrogen manifold. The power switch on the hydrogen manifold must be placed in the on position.

Note that the hydrogen manifold communication cable should be the only serial communication cable connected to the automatic gas console. When using another serial communication device such as an x/y controller or Inova torch height control, connect the communication cable from the external device to the "RS-422 In" plug on the hydrogen manifold. If multiple FineLine systems are being used in a network configuration, connect an RS-422 serial communication cable from the "RS-422 Out" plug on the hydrogen manifold to the "RS-422 In" plug on the additional FineLine system.

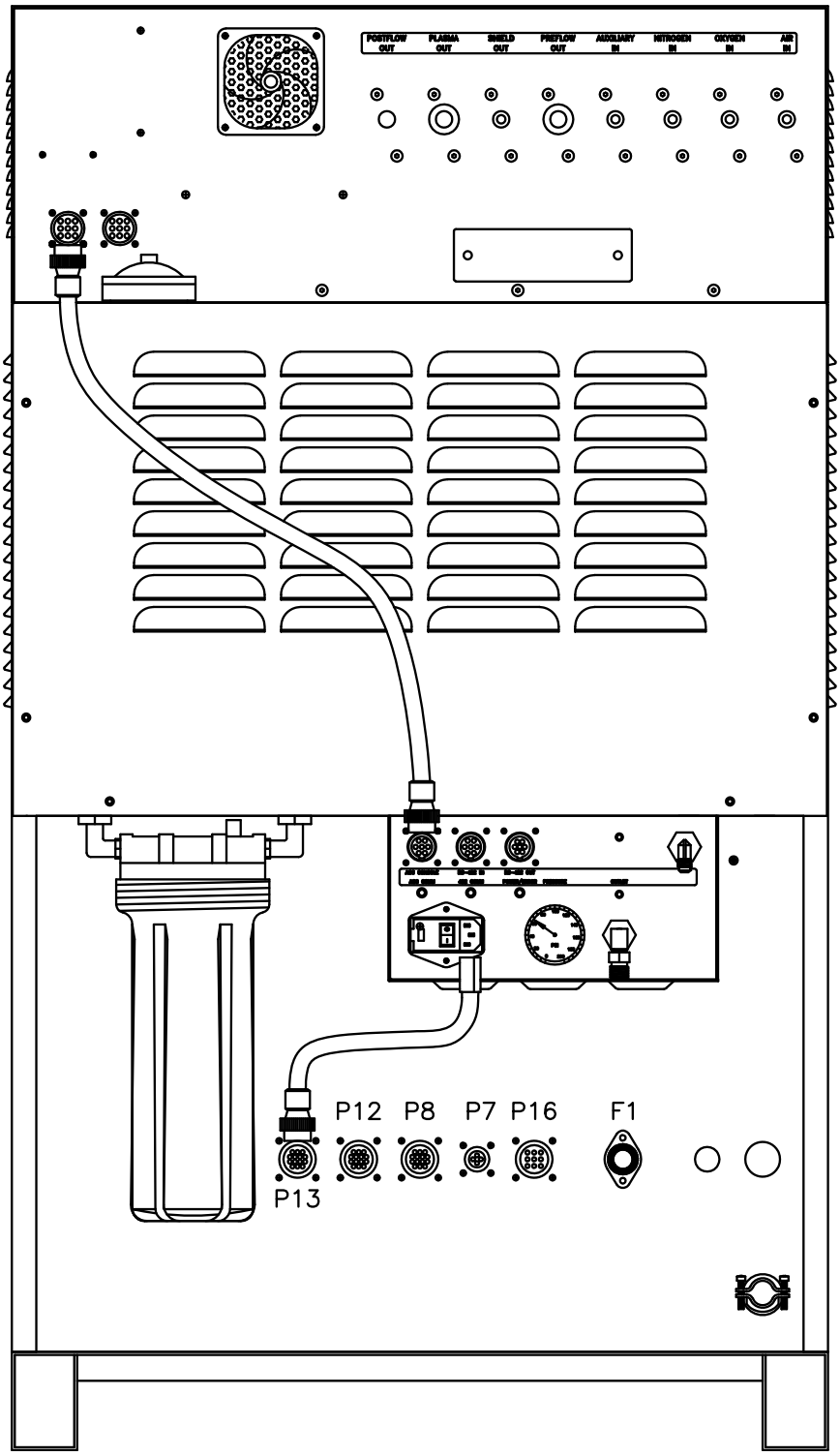


Figure C-2 Hydrogen Manifold Mounting Location

Operation

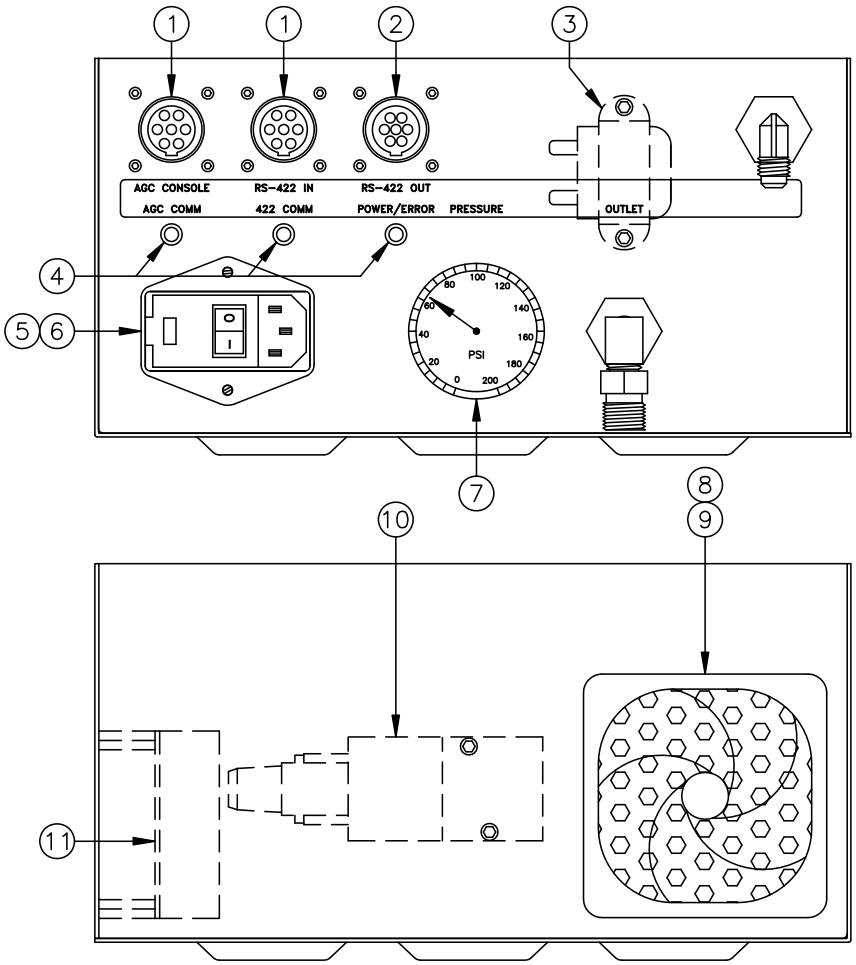
The hydrogen manifold is fully integrated with the operating software of the FineLine automatic gas console. When an appropriate thickness stainless steel is selected, H17 will be selected for the plasma gas and nitrogen will be selected for the shield gas. A message will alert the operator to move the plasma outlet hose from the rear of the automatic gas console to the outlet port of the hydrogen manifold. Simply move the hose, then press enter on the automatic gas console keypad to clear the alert. As with other operating conditions, ensure that the correct torch parts are installed before continuing with the cut.

During normal operation, the power/error LED on the front panel of the hydrogen manifold is constantly illuminated. When an error occurs, the LED flashes on and off to indicate an error. The number of flashes can be counted to determine what error has been encountered. The following chart shows the number of flashes and the corresponding errors.

Power/Error LED Number of Flashes	Error
1	AGC not found
2	Low H17 inlet pressure
3	Incorrect H17 outlet pressure
4	Lost communication with AGC

Parts List

Item Number	Part Number	Quantity	Description
1	709003	2	Receptacle, 9 position
2	709207	1	Receptacle, 7 position
3	706041	1	Transformer, 12V
4	704009	3	LED, panel mount
5	707006	1	Input power module
6	709033	1	Fuse, 1A
7	708076	1	Pressure gauge, 200 psi
8	200503	1	Fan
9	501147	1	Fan guard / filter
10	200502	1	Pressure regulator, electronic
11	200501	1	Power supply
Not Shown	708097	1	Pressure switch, 80-200 psi
Not Shown	200285	1	Microprocessor p.c. board
Not Shown	200505	1	Communication Cable
Not Shown	200504	1	Power Cable



Hydrogen Manifold Microprocessor P.C. Board (Assembly 200285)

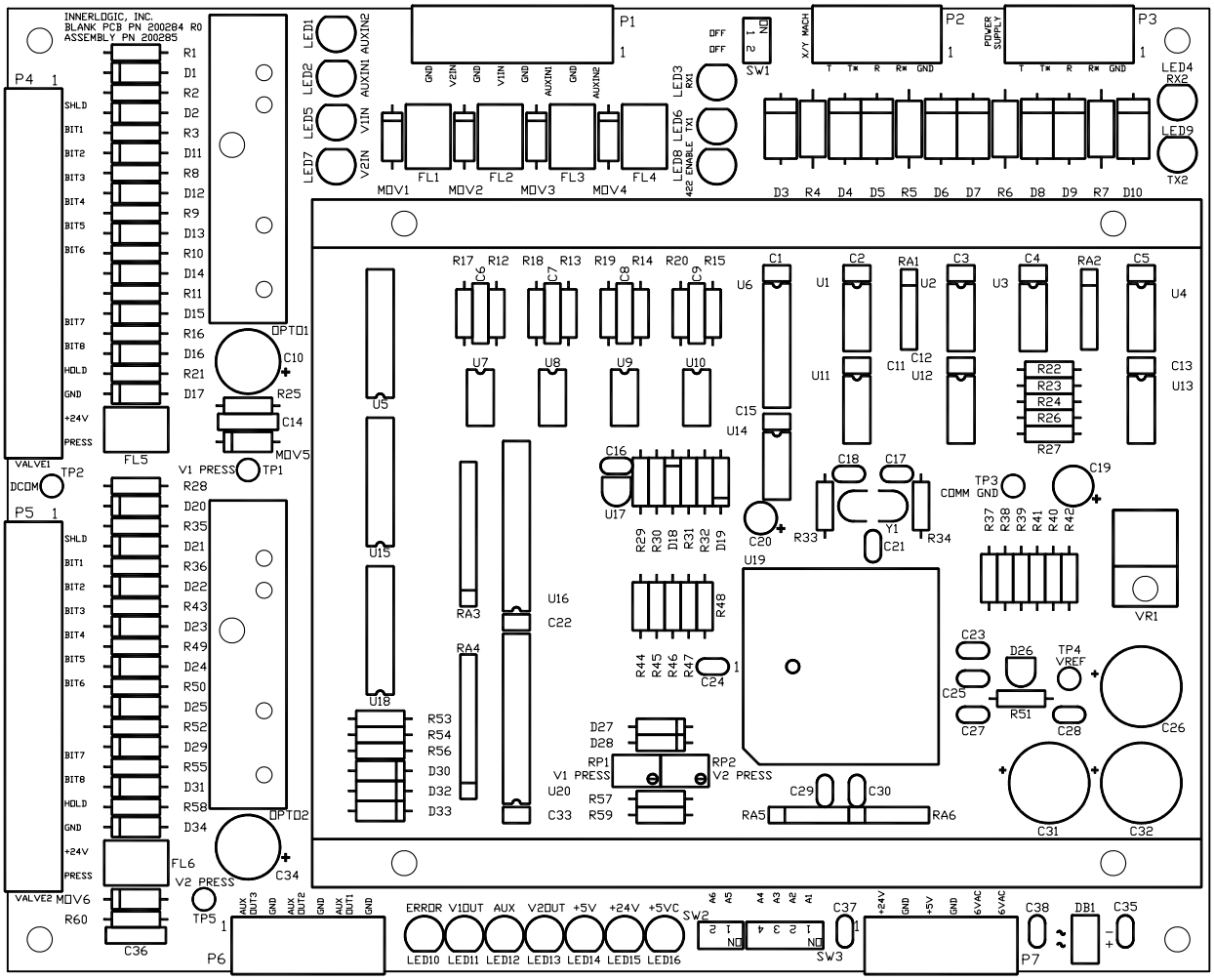


Figure C-3 Hydrogen Manifold Microprocessor P.C. Board

Dip Switch Settings

Dip Switch 1 (SW1): RS-422 Node Termination
SW1-1 and SW1-2 should be switched on if the manifold is the last on a string of nodes.
SW1-1 and SW1-2 should be switched off in all other manifolds on the network.

Dip Switch 3 (SW3): Pressure Diagnostics
SW3-1 energizes the pressure control valve and sets the output pressure to 65 psi. This is a diagnostic mode only.
SW3-2 energizes the pressure control valve and sets the output pressure to 115 psi. This is a diagnostic mode only.